July 2021

Binder 173, Plagiorchiidae A-B [Trematoda Taxon Notebooks]

Harold W. Manter Laboratory of Parasitology

Род *Alloplagiorchis* Simer, 1929

Диагноз рода (по Сеймеру, 1929)

Мелкие *Plagiorchiinae* с широко закругленными концами и овальным или круглым телом на поперечных срезах. Присоски круглые, причем диаметр передней достигает около $^2/_3$ диаметра брюшной присоски. Имеются префаринкс, фаринкс и пищевод. Кишечные стволы почти доходят до заднего конца тела. Семенники шаровидные или слегка лопастные, лежат по диагонали один позади другого. Половая бурса короткая, серповидная, почти одинакового диаметра на всем протяжении; она тянется от переднего края переднего семенника до полового отверстия, которое расположено на левом крае тела и слегка кпереди от уровня середины брюшной присоски. Семенной пузырек короткий, занимающий не более $^1/_3$ всей половой бурсы. Циррус способен выпячиваться. Яичник состоит из трех неглубоких лопастей и лежит справа и дорзально от переднего семенника. Лауреров канал имеется, а семяприемник отсутствует. Петли матки доходят до заднего конца тела. Яйца многочисленные, мелкие. Желточники фолликулярные, латеральные, лежат главным образом в задней трети длины тела.

Типичный и единственный вид: *Alloplagiorchis garricki* Simer, 1929.

Alloplagiorchis garricki Simer, 1929

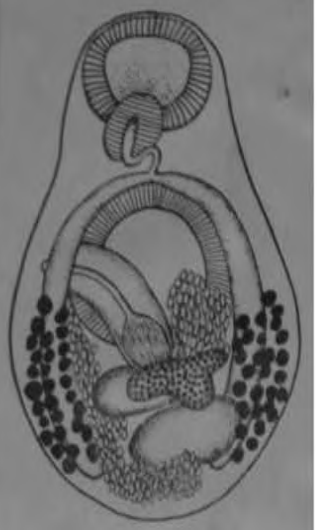
(Рис. 103)

Хозяин: рыба — *Carpiodes differmis*.

Локализация: кишечник.

Место обнаружения: США (Миссисипи).

Описание вида (по Сеймеру, 1929). Тело бутылковидное или цилиндрическое, длиною 0,65 мм при ширине 0,31 мм. Ротовая присоска круглая, с поперечным диаметром, равным 0,14—0,17 мм. Поперечный диаметр фаринкса в два раза меньше такового ротовой присоски. Пищевод слегка изогнут; кишечные стволы не доходят на 0,17 мм до заднего конца тела. Брюшная присоска относительно крупная, 0,20—0,27 мм в диаметре; она расположена в центре тела паразита. Семенники неправильной, но иногда прямоугольной формы, лежат вплотную один к другому около медианной линии близ заднего конца тела. Серповидная половая бурса начинается у переднего края переднего семенника на медианной линии тела. За шаровидным, тонкостенным семенным пузырьком следует толстостенное образование, заключающее простатическую часть и могущий быть выпяченным циррус. Спереди половая бурса загибается влево и входит в половой атриум у левого края брюшной присоски, приблизительно на уровне ее середины. Диаметр половой бурсы остается фактически одинаковым



103

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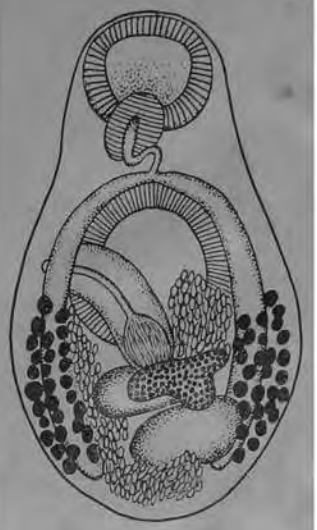

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ALLOPLAGIORCHIS

Aptorchiinae ~~n. subfam.~~ YAMAGUTI, 1958

Subfamily diagnosis. — Plagiorchiidae: Body elongate pyriform. Oral sucker and pharynx well developed; prepharynx long, esophagus short; ceca short, terminating anterior to testes. Acetabulum large, pre-

equatorial. Testes symmetrical, in posterior half of body. Cirrus pouch long, slender. Genital pore submedian, preacetabular. Ovary almost median, widely separated from acetabulum by uterus. No seminal receptacle. Vitellaria extending almost entire length of hindbody, confluent posteriorly. Uterus separated from posterior extremity by vitellaria. Parasites of turtles.

Aptorchis Nicoll, 1914

Generic diagnosis. — Plagiorchiidae, Aptorchiinae: Body elongated pyriform, spined. Acetabulum larger than oral sucker, pre-equatorial. Oral sucker followed by distinct prepharynx; longer than broad. Esophagus short. Ceca short, terminating a short distance posterior to acetabulum. Testes symmetrical, in posterior half of body. Cirrus pouch long, slender, sinuous. Genital pore anterosinistral to acetabulum. Ovary halfway between acetabulum and testes, a little out of median line. No receptaculum seminis. Vitellaria extending in almost entire lateral fields of hindbody. Uterine coils occupying all available space of hindbody, but separated from posterior extremity by vitellaria; eggs small. Excretory vesicle? Intestinal parasites of turtles.

Genotype: *A. aequalis* Nicoll, 1914 (Pl. 45, Fig. 557), in *Emydura latisternum* and *E. australis*; N. Queensland.

APTORCHIS Nicoll, 1914

Aptorchis aequalis Nicoll, 1914

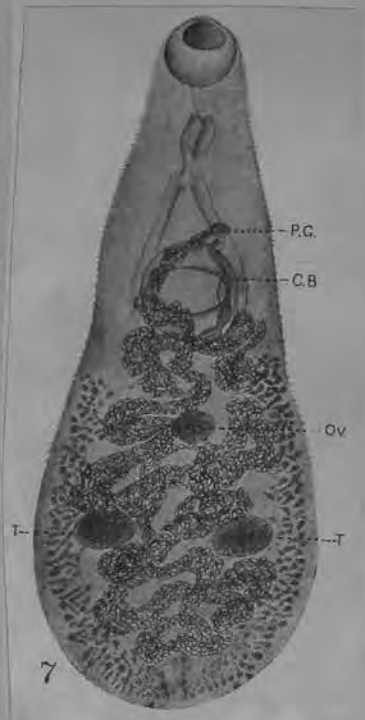
Only a single specimen of this form was obtained from the intestine of a turtle (*Emydura latisternum*). It is a small flat species the posterior part of which is broad and rounded. The width diminishes gradually towards the anterior end which is pointed. The cuticle is beset with moderately large spines.

The length is 2·1 mm. and the greatest breadth 0·85 mm. The oral sucker is globular, with a diameter of 0·21 mm. The ventral sucker measures 0·31 mm. and is situated 0·82 mm. from the anterior end of the body.

There is a distinct prepharynx, 0·1 mm. in length. The pharynx measures 0·135 × 0·105 mm. and the oesophagus 0·06 mm. The intestinal diverticula are short. They keep close to the ventral sucker and terminate a short distance behind it, the ends being obscured by the uterus. At the intestinal bifurcation the initial parts of the diverticula are somewhat swollen.

The genital aperture is situated a little in front of the ventral sucker, over the left intestinal diverticulum. The cirrus-pouch is a long, slender and sinuous structure which extends a little beyond the posterior border of the ventral sucker. It was found impossible to make out with accuracy the details of its internal structure. There appears to be a somewhat capacious genital sinus. The testes lie exactly midway between the ventral sucker and the posterior end of the body. They are symmetrically situated, transversely oval in shape and are separated by a space of 0·24 mm. Their dimensions are 0·11 × 0·18 mm. They are only slightly obscured by the uterus.

The ovary lies midway between the ventral sucker and the testes. It is almost median, somewhat oval, and measures 0·10 × 0·13 mm. No receptaculum seminis could be detected. The yolk glands are entirely lateral and extend from a little behind the ventral sucker to the posterior end of the body where, however, they do not unite. They are slightly higher on the left than on the right. They extend in from the edges of the body a considerable distance and overlap the uterus in places. The uterus is very voluminous. Starting from the oötype, it passes back between the testes and forms a number of convolutions in the post-testicular space. Passing forward again it fills up the greater part of the body behind the ventral sucker. The numerous ova measure 0·028–0·031 × 0·018–0·019 mm.



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ASTIA Looss

(Syn. Astiotrema Looss)

Body extended longitudinally, the posterior body being a little wider than the anterior, both ends rounded/ Esophagus medium long. Excretory bladder with very long stem which winds through between the testes as in Opisthorchis. Cirrus sac very long reaching far behind the acetabulum and containing almost the entire seminal vesicle which narrows into the ductus ejaculatorius; penis small; seminal redeptacle present; very small; Lauer's canal especially long. Vitellaria scarcely extending over inside the caeca. Uterus as in Lepoderma. So far as known in fish, freshwater turtle.

Type species Astia refinera (Looss.)

Astiotrema um

ASTIA

Astiotrematinae Baer, 1924

Subfamily diagnosis. — Plagiorchiidae: Body spatulate, lanceolate, or subcylindrical, spined or not. Oral sucker and pharynx small or moderately developed. Esophagus usually short, ceca reaching posterior extremity or not. Acetabulum small, in anterior third or fourth of body. Testes more or less oblique, in posterior half of middle third of body, usually separated one from the other by uterus. Cirrus pouch long, extending posterior to acetabulum, sometimes to near ovary. Genital pore median or submedian, preacetabular. Ovary more or less widely separated from acetabulum as well as from anterior testis. Receptaculum seminis present or absent. Vitellaria extending in lateral fields of hindbody, commencing at varying levels, but not reaching posterior extremity. Uterus extending to posterior extremity. Parasites of chelonians and fishes.

Key to genera of Astiotrematinae

1. Body spatulate or lanceolate 2
   Body more elongated lanceolate to subcylindrical 4
2. Vitellaria commencing at about level of acetabulum or in front of it 3
   Vitellaria commencing behind acetabulum and terminating near posterior extremity; cirrus pouch long, reaching to near ovary; parasites of tortoises ..... *Glossimetra*
3. Cirrus pouch large, reaching to ovary; genital pore preacetabular; vitellaria terminating at level of anterior or posterior testis; parasites of tortoises and fishes . . *Astiotrema*
   Cirrus pouch not reaching to ovary; genital pore halfway between acetabulum and intestinal bifurcation; vitellaria terminating behind posterior testis ..... *Allopharynx*
4. Cirrus pouch reaching to ovary; vitellaria commencing at level of ovary or behind it; forebody enlarged; parasitic in lungs of snakes ..... *Glossidiella*
   Cirrus pouch not reaching to ovary; vitellaria commencing anterior to ovary; seminal receptacle present or absent . . 5
   Cirrus pouch and ovary very widely separated by uterine coils; vitellaria commencing far anterior to ovary; seminal receptacle and Laurer's canal present 6
5. Body tapering anteriorly to a sharp point; esophagus moderately long; receptaculum seminis voluminous; parasites of turtles ..... *Spinometra*
   Body not tapering anteriorly to a sharp point; esophagus practically absent; receptaculum seminis absent (?); parasites of tortoises; ..... *Microderma*
6. Esophagus practically absent, bifurcating a considerable distance anterior to acetabulum; ovary postequatorial; parasites of iguanids ..... *Parallopharynx*
   Esophagus bifurcating slightly anterior to acetabulum; ovary pre-equatorial; parasites of snakes ..... *Neomicroderma*

Key to genera of Astiotrematinae from fishes

Testes separated one from the other by uterine coils .... *Astiotrema*
Testes not separated by uterine coils ..... *Alloglossidium*

Astiotrema Looss, 1900

Syn. *Astia* Looss, 1899, preoccupied

Generic diagnosis. — Plagiorchiidae, Astiotrematinae: Body spatulate, spined, hindbody somewhat broader than forebody. Oral sucker may be larger or smaller than acetabulum. Esophagus of moderate length. Ceca terminating near posterior extremity or some distance anterior to it. Testes somewhat diagonal; anterior one equatorial or postequatorial. Cirrus pouch claviform, elongate, reaching to ovary, containing large seminal vesicle, prostatic complex and ductus ejaculatorius. Genital pore immediately pre-acetabular, median or slightly to one side. Ovary submedian, pre-equatorial. Receptaculum seminis sometimes very large, postovarian. Vitellaria extending in extracecal fields for about half length of body or less. Uterus inter- and postcecal, reaching to posterior extremity. Excretory stem passing between two testes in a sigmoid curve, divided into two short arms between ovary and anterior testis. Gastrointestinal parasites of fishes and tortoises.

Genotype: *A. reniferum* (Looss, 1898) Stoss., 1904 (Pl. 44, Fig. 544), syn. *Distoma unicum* Looss, 1896, renamed, in *Trionyx nilotica;* Egypt.

Representatives from reptiles:

A. amydae Ogata, 1938, in *Amyda maackii;* Manchuria. Also in *Trionyx sinensis;* Korea.

A. elongatum Mehra, 1931, syn. *A. gangeticum* Harsche, 1932 — Dayal (1938), in *Trionyx gangeticus;* India.

A. emydis Ejsmont, 1930, in *Emys orbicularis;* Poland.

A. foochowense Tang, 1941, in *Amyda tuberculata;* China.

A. fukuii Ogata, 1938, in *Amyda maackii;* Korea.

A. indicum Thapar, 1933, in *Chitra indica;* India.

A. loossii Mehra, 1931, syn. *A. gangeticus* Harshe, 1932, from *Emyda granosa* — Bhalerao (1936), in *Kachuga dhongoka* and *Lissemys punctata;* India.

A. monticellii Stosich, 1904, in *Tropidonotus viperinus;* Naples.

A. odhneri Bhalerao, 1936, pro *A. reniferum* Looss of Odhner, 1911, in *Trionyx triunguis;* N. E. Africa.

A. orientale Yamaguti, 1937, in *Amyda japonica;* Korea.

A. rami Bhalerao, 1936, in *Lissemys punctata;* Burma.

Representatives from fish hosts:

A. dassia Dayal 1938, in *Clarias batrachus;* India.

A. impletum Looss, 1899 (Pl. 19, Fig. 237), in *Tetrodon fahaka;* Cairo.

A. spinosum Chatterji 1933, in *Clarias batrachus;* India.

ASTIOTREMA Looss

Diagnosis as given by Mehra, 1931:

Body tongue shaped or elliptical, cuticle smooth or covered with spines, anterior and posterior ends somewhat rounded, the latter always broader, ventral sucker in first quarter or between first and second quarters. Prepharynx and pharynx present, intestinal bifurcation a little or much in front of ventral sucker or near its posterior margin, ceca terminateing at anterior or posterior margin of posterior testes or a way between posterior testis and posterior end of body. Genital pore median or slightly to left close in front of ventral sucker. Testes round or ovid, entire or lobed, oblique or some what tandem. Ovary rounded subsphereical or elongated, entire or lobed, in front of testes behind ventral sucker, usually to the right, sometimes to the left. Cirrus sac muscular, more or less conical, with broad basal saccular part extending far behind ventral sucker, and narrow tubular terminal portion situated situated dorsally or close to right side of latter; seminal vesical large, straight and thin walled, filling entirely the sacular part if cirrus sac; pars prostatica short; small protrusible cirrus usually present. Seminal receptacle present; Laurer's canal long. Uterus convoluted with ascending and descending convolutions charactistically arranged and passing between testes and hind end of body and returning the same way. Vitellaria composed of pear shaped follicles more or less arranged in groups extending from middle of esophagus, intestinal bifurcation or ventral sucker to middle of anterior testis, anterior or posterior margin of posterior testis or a little in front of posterior end of body. Excretory vesicle Y-shaped with a long cylindrical or slightly S-shaped main stemextending forwards as far as seminal receptacle where it divided into two prominent cornua. Excretory pore terminal or ventral. Eggs 23 to 41 by 10 to 15 μ Habitat: stomach and intestine of tortoises and snakes (Tropidonotus) and fish (Tetradon).
Locality: Egypt, Italy and India.

Asiotrema Looss, 1900 emend. Mehra, 1931

Syn.: *Distoma unicum* Looss, 1898, *Astia* Looss, 1899, *Astiotrema* Odhner, 1911.

Olsen, 1937

Generic diagnosis: Body somewhat elliptical; anterior and posterior ends somewhat rounded; acetabulum in first or second quarter of body length. Prepharynx and pharynx present, intestinal bifurcation little or much anterior to or just posterior to acetabulum; intestinal caeca may terminate near anterior margin of posterior testis or near posterior end of body. Genital opening close in front of acetabulum. Testes round or ovoid, entire or lobed, situated obliquely or somewhat tandem. Ovary round, subspherical or elongated, entire or lobed. Cirrus sac muscular, more or less conical with broad basal and thin anterior end, saccular part extending far behind acetabulum, seminal vesicle large; penis small, may or may not be protrusible, seminal receptacle large; Laurer's canal long. Convoluted uterus extends to posterior end of body. Vitellaria extend caudad from middle of oesophagus, intestinal bifurcation or acetabulum to middle of anterior testis or a little before posterior end of body. Excretory bladder Y-shaped, stem reaches to seminal receptacle.

Key to the Species of *Asiotrema*

1. Intestinal bifurcation postacetabular; intestinal caeca terminate anterior to posterior testis; vitelline follicles few. (Intestine of *Tropidonotus viperinus;* Italy; fig. 9.) ..... *A. monticelli* Stossich, 1904.
   Intestinal bifurcation preacetabular 2
2. Oral sucker smaller than acetabulum 3
   Oral sucker about equal to or larger than acetabulum 4
3. Testes deeply lobed; vitellaria extend to or beyond posterior testis. (Intestine of *Kachuga dhongoka, Emyda granosa;* India; fig. 8.) ..... *A. loossii* Mehra, 1931 (syn. *A. gangeticus*).
   Testes rounded, margins smooth; vitellaria extend from posterior margin of acetabulum to area between testes. (Intestine of *Clarias batrachus;* Burma; fig. 5a.) ..... *A. spinosa* Chatterji, 1933.
4. Oral sucker equal to acetabulum; ovary with posterior margin deeply indented; seminal vesicle very large, lunate, elongated in transverse axis of body; testes lobated, wider than long; intestinal caeca terminate near end of body. (Intestine of *Chitra indica;* India; fig. 7.) ..... *A. indica* Thapar, 1933.
   Oral sucker larger than acetabulum 5
5. Vitelline follicles confluent medially anterior to acetabulum; testes and ovary rounded and about equal in size. (Intestine of *Emys orbicularis;* Poland; fig. 4.) ..... *A. emydis* Ejsmont, 1930.
   Vitelline follicles not confluent; testes distinctly larger than ovary .. 6
6. Vitellaria extend from middle of oesophagus to near middle of anterior testis; intestinal caeca terminate quite some distance from end of body. (Intestine of *Tetradon fahaka;* Egypt; fig. 6.) ..... *A. impletum* Looss, 1899 emend. Odhner, 1911.
   Vitellaria extend caudad from anterior testis but not anteriorly from intestinal bifurcation 7
7. Intestinal caeca short, terminate at level of caudal margin of posterior testis. (Intestine of *Trionyx triunguis;* Egypt; fig. 10) ..... *A. odhneri* Bhalerao, 1936.
   Intestinal caeca longer, terminate caudad from posterior testis 8
8. Vitellaria extend cephalad from acetabulum; testes longer than broad, margins irregular but not deeply notched. (Intestine of *Trionyx gangeticus;* India; fig. 3.) ..... *A. elongatum* Mehra, 1931.
   Vitellaria do not extend cephalad from acetabulum 9
9. Testes reniform; ovary near middle of body. (Intestine of *Trionyx nilotica;* Egypt; fig. 5.) ..... *A. reniferum* (Looss, 1899).
   Testes round, or irregular; ovary nearer to acetabulum. (Intestine of *Lissemys punctata;* India; fig. 50b.) ..... *A. rami* Bhalerao, 1936.

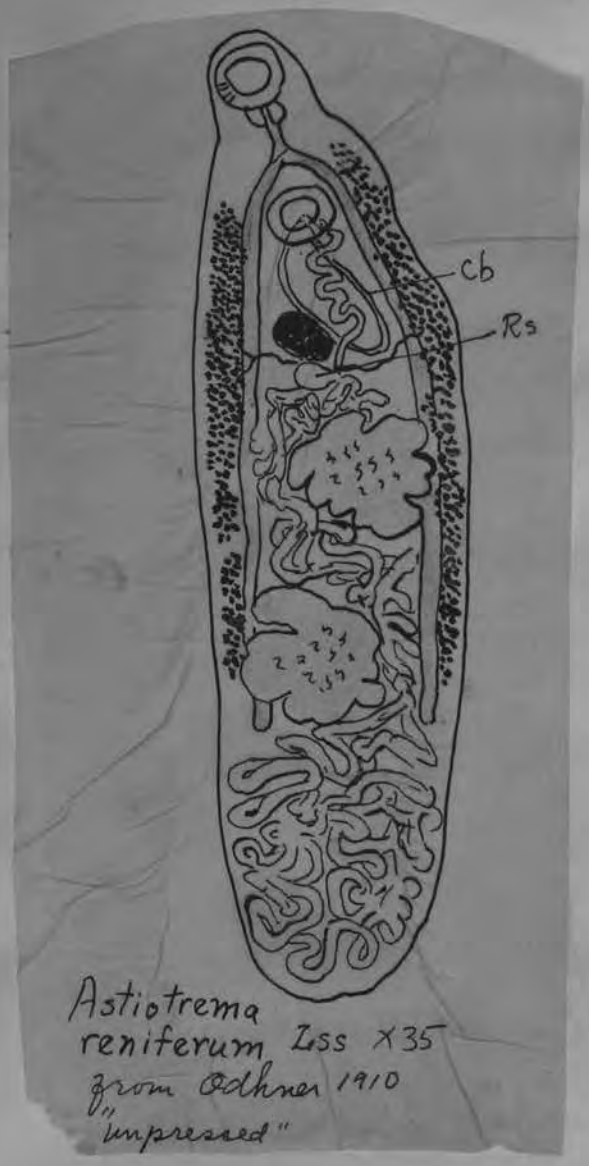
ASTIOTREMA Looss

Synonym; Astia Looss

Body extended longitudinally, the posterior body being a little wider than the anterior, both ends rounded. Esophagus moderately long. Excretory bladder with a very long stem which winds between testes as in Opisthorchis. Cirrus sac very long reaching far behind the acetabulum and containing almost the entire seminal vesical which narrows into the ductus ejaculatoris; cirrus small; seminal receptacle present, very small; Laurer's canalespecially long. Vitellaria scarcely extending over inside the ceca. Uterus as in Lepoderma. Known from fish and fresh-water turtle

Type species: Astiotrema refinerum (Looss) (1898)

This diagnosis was modified and amplified by Mehra (1931)



Astiotrema reniferum Loss ×35
from Odhner 1910
"impressed"

Renamed A. odhneri by Bhalerao 1936

Plagiorchidae

Key to species of ASTIOTREMA Looss

(from Dayal, J., 1938. Proc. Nat. Acad. Sci., India, 8(1):10-14)

1. Oral sucker equal to ventral sucker.....2
   Oral sucker smaller than ventral sucker.....3
   Oral sucker larger than ventral sucker.....4

2. Receptaculum seminis larger than ovary, semilunar in shape. Vitelline glands extend from the ventral sucker to anterior end of posterior testis.....A. indica Thapar, 1933
   Receptaculum seminis much smaller than ovary and pear-shaped. Vitelline glands extend from the ventral sucker to posterior end of posterior testis.....A. dassia Dayal, 1938

3. Testes rounded, margins smooth, vitelline glands from ventral s ucker to hinder end of the anterior testis.....A. spinosa Chatterji, 1933
   Testes rounded, vitelline glands mainly extra-cecal from a little behind acetabulum to near cecale ends, leaving the latter uncovered..A. orientale Yamaguti 1937
   Testes deeply lobed, vitellaria from the ovary to the hinder region of the posterior testis where they extend beyond it.....A. loossii Mehra, 1931

4. Intestinal bifurcation posterior to ventral sucker, intestinal ceca terminate anterior to posterior testis, vitelline glands few.....A. monticelli (Stossich, 1904)
   Intestinal bifurcation anterior to ventral sucker.....5

5. Vitelline follicles confluent medially anterior to acetabulum, testes and ovary rounded and about equal in size.....A. emydis Ejsmont, 1930
   Vitelline follicles not confluent anterior to acetabulum, testes distinctly larger than ovary.....6

6. Testes rounded with smooth margins 7
   Testes lobed.....9

7. Intestinal bifurcation behind genital pore, vitelline glands from the middle of esophagus to middle of anterior testis.....A. impletum (Looss, 1899)
   Intestinal bifurcation in front of genital pore.....8

8. Testes kidney-shaped, vitteline glands extend from the ventral sucker to anterior testis, ovary near middle of the body.....A. reniferum (Looss, 1898)
   Testes rounded, vitelline glands extend from the ventral sucker to the anterior region of the posterior testis, ovary near acetabulum.....A. rami Bhalerao, 1936

9. Testes not deeply lobed, intestinal ceca extending behind posterior testis.....A. elongatum Mehra, 1931
   Testes deeply lobed, intestinal ceca not extending behind posterior testis.....A. odhneri Bhalerao, 1936

Key to species of Astiotrema Looss

(from Mehra 1931)

Ovary lobed.....Ast.loossii Mehra, 1931

Ovary entire
  Intestinal bifurcation at posterior
    margin of ventral sucker.....Ast. monticelli Stossa, 1964
  Intestinal bifurcation in front
    of ventral sucker.....
    Vitellaria terminating at middle
      of anterior testis.....Ast.impletum (Looss)
    Vitellaria terminating behind
      anterior testis
      Diameter of suckers 0.25-0.3 mm.,
        Testes broader than long....Ast.reniferum (Looss)
      Diameter of suckers 0.36-0.62 mm.,
        testes longer than broad....Ast.elongatum
        Mehra, 1931

From N.K. Gupta, 1954

Genus **Astiotrema** Looss, 1900

Diagnosis

Plagiorchiidae Luhe, 1901, emend. Ward, 1917; Plagiorchiinae Luhe, 1 emend. Pratt, 1902. Shape and size: elliptical or elongated, flattened so-ventrally with somewhat rounded anterior and posterior ends, size iable. Bodywall: spinous, spines more closely arranged in the anterior ion. Suckers: oral sucker may be larger or smaller than, or equal to tral sucker; ventral sucker in the first half of the body. Digestive tem: prepharynx present or absent; pharynx always present; intestinal ca terminate either at level with posterior testis or behind it or just in nt of the posterior end of the body. Reproductive system: testes round- ovoid, entire, notched anteriorly or lobed, placed obliquely or tandem position; cirrus sac conical, elongated with broad basal part extending to the front or middle or posterior margin of ventral sucker or far behind anterior part is tubular curving round or overlapping partly the ventral ker; vesicula seminalis straight, thin-walled, confined basally to cirrus ; pars prostatica short; cirrus protrusible; ovary spherical or sub- rical or kidney-shaped, or lobed or entire, pre-testicular, posterior to ventral sucker, to the right if examined ventrally, left, if seen from al side; receptaculum seminis always present; uterine coils form both ending and ascending limbs passing between the testes; vitellaria nged in groups or scattered along the lateral sides, the extent variable; ital pore median or slightly lateral to median line. Excretory system: haped.

Host and Location	..	Stomach and intestine of tortoises, snakes and fishes.
Locality	..	India, Egypt, Italy, Poland, Korea and Japan.
Type Species	..	*Astiotrema reniferum* (Looss, 1898) Looss, 1900.

Looss in 1899 created the genus *Astia* for the species *A. reniferum istomum reniferum* Looss, 1898) and *A. impletum* Looss, 1899. The mer species was obtained by him in 1898 from the intestine of a turtle— *ionyx nilotica*—and the latter in 1899 from the intestine of *Tetredon haka*. As the name *Astia* was found to be preoccupied, the same author, year later, changed the name of the genus to *Astiotrema*. Stossich in 04 added another species to the genus—*A. monticellii*—from the intestine *Tropidonotus viperinus*. The specimens on which the species was based Stossich had actually been collected by Monticelli (1891) who had rongly referred them to *Distomum signatum* Dujardin (1845). Stossich 04) also placed the parasite *Distomum erinaceum* Poirier (1886) under genus *Astiotrema*. Odhner (1911) elaborated the description of the o species, namely, *A. reniferum* and *A. impletum* and removed *Distomum naceum* from the genus *Astiotrema*.

Ejsmont (1930) from Poland described *A. emydis* from the stomach d duodenum of *Emys orbicularis*. In 1931, Mehra gave the description two species, viz., *A. elongatum* from the intestine of *Trionyx gangeticus* d *A. loossii* from the intestine of *Kachuga dhongoka*. A year later, arshey described *A. gangeticus* from the intestine of *Lissemys punctata nctata* (Syn. *Emyda granosa*) at Allahabad. Thapar in 1933 gave the count of a new species *A. indica* from a tortoise *Chitra indica*, and

— OVER —

Chatterji in the same year described *A. spinosa* from *Clarias batrachus* (Linnaeus, 1785). Bhalerao in 1936 found another new species to which he gave the name *A. rami*. He also pointed out that the specimens which Odhner (1911) dealt with as *A. reniferum* were actually not of *A. reniferum*, but represented a new species to which he gave the name *A. odhneri*.

Yamaguti in 1937 from Japan obtained *A. orientale* from the intestine of *Amyda japonica*. From India again, Dayal in 1938 described *A. dassia* from the intestine of *Clarias batrachus*. In the same year from Poland, Modrzejewska redescribed *A. emydis* from *Emys orbicularis*. Ogata in 1938 from Japan gave the preliminary description of *A. amydae* and *A. fukuii* from the intestine of *Amyda maackii*. His description was without any illustration. Tang in 1941 from China added *A. foochowensis* from the intestine of a turtle *Amyda tuberculata* to the list of species of the genus.

I have added five new species, namely, *A. nathi*, *A. hoshiarpurium*, *A. srivastavai*, *A. thapari* and *A. matthaii*.

Synonymity of species

The species *Astiotrema gangeticus* Harshey (1932) has already been synonymized with *A. loossii* Mehra (1931) by Bhalerao (1936). The differences on the basis of which Harshey distinguishes *A. gangeticus* from *A. loossii* are the presence of spines on the ventral surface, continuous vitelline follicles, rounded ovary and larger size of receptaculum seminis. Bhalerao (1936) points out that in his specimens of *A. loossii* the ovary and the receptaculum seminis are similar to that of *A. gangeticus* but the vitellaria are arranged in groups on one side, while on the other side they are contiguous except for a short distance towards the anterior side. He further points out that the presence of vitelline follicles in groups or otherwise is not a point of specific importance and the presence of spines on the ventral surface should not be taken as a character for separating the two species. Therefore, *A. gangeticus* is regarded as a synonym of *A. loossii*.

In discussing the validity of his new species *A. amydae*, Ogata (1938) points out that it resembles closely *A. orientale* but differs from it in the size of its eggs. I have compared both the species very carefully and I find that *A. amydae* is only a synonym of *A. orientale*. It resembles in the smaller size of the oral sucker as compared to the ventral sucker, in the shape of testes, the extension of intestinal caeca and the vitellaria. The minor difference in size of the eggs of the species should not be taken as of sufficient importance to warrant the separation of the two species. I, therefore, regard *A. amydae* as a synonym of *A. orientale*.

Tang in 1941 describes a new species *A. foochowensis* from the intestine of *Amyda tuberculata* in Foochow. From his discussion on the validity of *A. foochowensis*, Tang does not seem to be aware of *A. orientale* Yamaguti, 1937, with which the former species resembles closely. *A. foochowensis* resembles *A. orientale* in the extent of intestinal caeca, the vitellaria, in having a smaller oral sucker and in the shape of the testes. Thus, in all essential features *A. foochowensis* and *A. orientale* are alike and should be regarded as synonymous.

From N. K. Gupta, 1954

A key to the identification of all the valid species of the genus *Astiotrema* Looss (1900) based on the undermentioned characters has been prepared.

1. Size of suckers.
2. Position of ventral sucker.
3. Length of oesophagus.
4. Length of intestinal caeca.
5. Position of genital pore.
6. Shape and arrangement of testes.
7. Cirrus sac.
8. Shape of ovary.
9. Extent of vitellaria.

FROM N. K. GUPTA, 1954

KEY TO THE SPECIES OF THE GENUS *ASTIOTREMA* LOOSS, 1900

	Oral sucker larger than ventral sucker	A.
	Oral sucker smaller than ventral sucker	B.
	Oral sucker equal to ventral sucker	C.
A.	Ventral sucker in front of intestinal bifurcation	*A. monticellii* Stossich, 1904.
	Ventral sucker behind the intestinal bifurcation ..	1.
1.	Genital pore in front of the intestinal bifurcation ..	*A. impletum* (Looss, 1899) Looss, 1900.
	Genital pore behind the intestinal bifurcation	2.
2.	Intestinal caeca short, terminate at level of the caudal margin of posterior testis	3.
	Intestinal caeca longer, terminate behind the posterior testis ..	4.
3.	Testes with entire margins ..	3a.
	Testes lobed; vitellaria extending from the level of ventral sucker or cephalad to it up to the posterior margin of posterior testis	*A. odhneri* (Odhner, 1911) Bhalerao, 1936.
3a.	Testes tandem in position, spherical or elliptical	*A. fukuii* Ogata, 1938.
	Testes obliquely placed ..	$3a_1$.
$3a_1$.	Testes oval, anterior testis slightly notched on its anterior aspect; oesophagus long; ovary spherical; vitellaria extend from level of ovary or a little in front of it, but not reaching the ventral sucker, up to the posterior margin of anterior testis ..	*A. nathi*, n.sp.
	Testes transversely elongated, oesophagus short; ovary also transversely elongated; vitellaria from the level of ventral sucker to the middle of posterior testis	*A. matthaii*, n.sp.

4. Vitelline follicles confluent medially to ventral sucker; testes and ovary of the same size .. *A. amydis* Ejsmont, 1930.

Vitelline follicles not confluent medially; testes distinctly larger than ovary .. .. 4a.

4a. Vitellaria extend cephalad from ventral sucker but not anterior to intestinal bifurcation .. $4a_1$.

Vitellaria do not extend cephalad to ventral sucker .. .. 4a.

$4a_1$. Testes with margins irregular, not deeply notched .. .. *A. elongatum* Mehra, 1931.

Testes deeply notched from anterior aspects only .. ***A. hoshiarpurium***, n.sp.

$4a_2$. Testes spherical or irregular; cirrus sac and uterus on the opposite sides of the ventral sucker .. ***A. rami*** Bhalerao, 1936.

Testes broader than long; cirrus sac and terminal portion of the uterus on one side of ventral sucker; ovary near the middle of body .. .. ***A. reniferum*** (Looss, 1899 Looss, 1900.

B. Intestinal caeca terminate behind the posterior testis .. B_1.

Intestinal caeca terminate near the level of caudal margin of posterior testis .. .. B_2.

B_1. Testes deeply lobed, ovary kidney-shaped; vitellaria extend to or beyond the posterior testis *A. loossii* Mehra, 193 Syn. *A. gangeticus* Ha shey, 1932.

Testes rounded, margins smooth, ovary rounded; vitellaria extend from posterior margin of ventral sucker to area between testes .. *A. spinosa* Chatterji, 1933

B_2. Testes with entire margins, vitellaria extend from the level of ventral sucker or slightly behind it to near the ends of intestinal caeca .. .. .. ***A. orientale*** Yamaguti, 1937 Syn. *A. amydae* Ogat 1938. *A. foochowensi* Tang, 1941.

Testes notched on their anterior aspects, caudad in position; ovary near the equatorial line of the body; vitellaria extend from the level of genital pore to the hinder margin of anterior testis .. .. .. ***A. srivastavai***, n.sp.

C. Testes tandem in position, slightly lobed on all sides; ovary oval; vitellaria extend from ventral sucker to the hinder margin of posterior testis .. .. *A. dassia* Dayal, 1938.

Testes obliquely placed .. C_1.

C_1. Testes lobed, wider than long; ovary with posterior margin deeply indented; vitellaria extending from the level of ventral sucker to the anterior end of posterior testis .. .. *A. indica* Thapar, 193

Testes not lobed, irregular in shape, ovary spherical; vitellaria extending from the pre-acetabular region, i.e., between the intestinal bifurcation and ventral sucker to the middle of posterior testis .. .. .. *A. thapari*, n.sp.

FROM N. K. GUPTA, 1754

KEY TO THE SPECIES OF THE GENUS *ASTIOTREMA* LOOSS, 1900

1. Esophagus short 2
   Esophagus long 4

   2. Vitellaria confluent anterior to ventral sucker ..... *A. emydis* Ejsmont, 1930
      Vitellaria not confluent anterior to ventral sucker 3

3. Vitellaria confluent medially behind posterior testis and ovary preequatorial .....
   A. lissemydis n. sp.
   Vitellaria not confluent medially behind posterior testis and ovary equatorial .....
   A. cyclemydis Siddiqi, 1965

   4. Vitellaria extend from pharnyx up to hind end of posterior testis 5
      Vitellaria restricted to anterior half of body ..... *A. impletum* (Looss, 1899) Looss, 1900

5. Vitellaria restricted to second quarter of body ..... *A monticellii* Stossich, 1904
   Vitellaria from pharynx to hind end of posterior testis ..... *A. reniferum* (Looss, 1899) Looss, 1900

DISCUSSION

There are 21 species of the genus *Astiotrema* Looss, 1900 reported so far from different parts of the world. They are *Astiotrema reniferum* (Looss, 1898) Looss, 1900; *A. impletum* (Looss, 18 9) Looss, 1900; *A. monticellii* Stossich, 1904; *A. emydis* Ejsmont, 1930; *A. elongatum* Mehra, 1931 and *A. Loossii* Mehra, 1931; *A gangeticus* Harshey, 1932; *A spinosa* Chaterji, 1933; *A. indica* Thaphar, 1933; *A. rami* Bhalerao, 1936; *A. odhneri* (Odhner, 1911) Bhalerao, 1936; *A. orientale* Yamaguti, 1937; *A dassia* Dayal, 1938; *A. amydae* Ogata, 1938; *A fukuii* Ogata, 1938; *A. foochowensis* Tang, 1941; *A. nathi*, *A. matthai*; *A. hoshiarpurium*, *A. srivastavai* and *A thapari* Gupta, 1954; *A. gangeticus* has been synonymized to *A. loossii* by Bhalarao, 1936. *A. amydae* and *A. foochowensis* have been synonymised to *A. orientale* by Gupta (1954).

A. giganticum n. sp. and *A. lobiorchis* n. sp. differ from all the known species of *Astiotrema* except *A. odhneri*, *A. loossii* *A. dassia* and *A. indica* in the possession of deeply lobed testes. They differ from *A. odhneri*, *A. dassia* and *A. indica* in relative size of suckers, shape of testes, and extension of vitellaria; and from *A. loossii* in size, extension of vitellaria shape of ovary and testes, and size of receptaculum seminis. They differ from each other in size, lobulation of testes, (in *A. giganticum* testes are deeply notched at their anterior faces) and in the extension of vitellaria and intestinal caeca.

A. mehrai n. sp. differs from all the known species of the genus except *A dassia*, *A. indica* and *A. thapari* in having both the suckers equal. It differs from them in the possession of rounded testes, extension of intestinal caeca and in the distribution of vitellaria.

The above differentiating characters lead to the creation of three new species of the genus *Astiotrema* viz. *Astiotrema giganticum*, n. sp ; *A. lobiorchis* n. sp. and *A. mehrai* n. sp.

From Tiwari, 1958

Astiotrema reniferum (Looss, 1898) Looss, 1900

Синонимы: *Distomum unicum* Looss, 1896, nec Molin; *Distomum reniferum* Looss, 1898; *Astia renifera* (Looss, 1898) Looss, 1899

Хозяин: черепаха — *Trionyx nilotica*.

Локализация: тонкие кишки.

Место обнаружения: Египет.

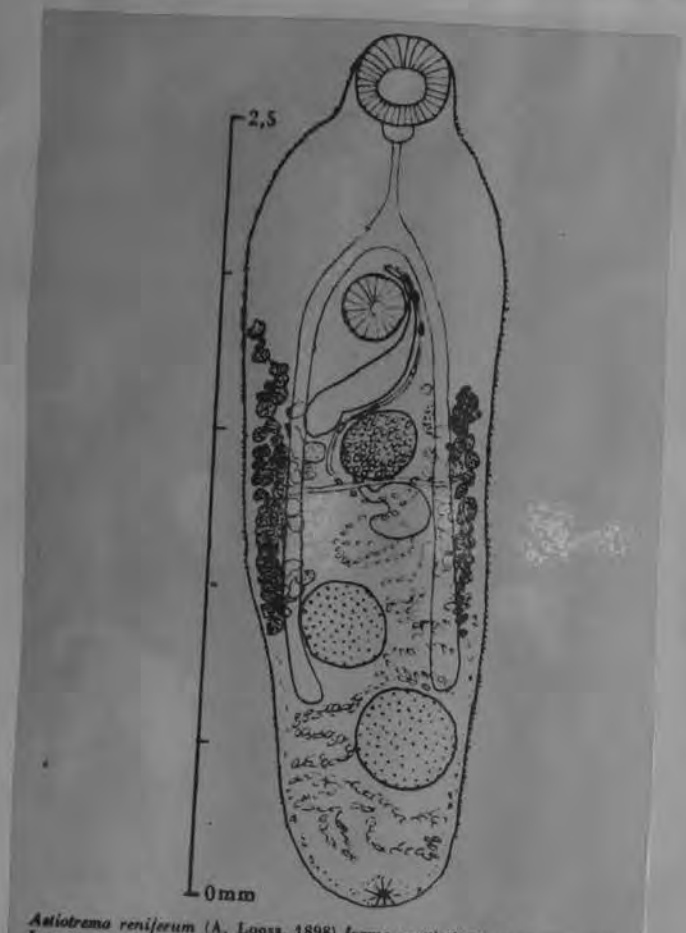
Историческая справка. Лооссом в 1896 году была описана под именем *Distomum unicum* новая трематода от черепах *Trionyx nilotica* из Египта. После того как Стайлс (Stiles) указал Лооссу, что название *Distomum unicum* является преоккупированным, поскольку Молин описал под именем *Distomum unicum* трематоду от птицы *Centolophus pompilius*, Looсс переименовал свою трематоду в 1898 году, назвав ее *Distomum reniferum*.

В 1899 году Looсс, раздробивший старый род *Distomum* на многочисленные новые роды, отнес *Distomum reniferum* к роду *Astia*. Однако вскоре было выяснено, что и род оказался преоккупированным, в результате чего Looсс вынужден был переименовать в 1900 году род *Astia* в *Astiotrema*. Тем самым трематода, открытая Лооссом, получила наименование *Astiotrema reniferum* (Looss, 1898) Looss, 1900.

Как было указано выше, Однер (1911) отнес к этому виду трематоду из кишечника черепахи *Trionyx triungius* (Египет) и дал подробное описание. Балерао в 1936 году доказал, что Однер сделал ошибку, так как описанная им трематода резко отличается от типичной *Astiotrema reniferum* (Looss, 1898). Поэтому Балерао обосновал для трематоды, описанной Однером (1911), новый вид, наименованный им *Astiotrema odhneri* Bhalerao, 1936.

Описание вида мы, к сожалению, привести не можем, поскольку в нашем распоряжении не имеется работ Looсса, 1896.

Литература: Looss, 1896; Looss, 1898; Looss, 1899, стр. 590—591; Looss, 1900.



Astiotrema reniferum (A. Looss, 1898) forma *matthaii* N. K. Gupta, 1954. Intestin de *Kachuga kachuga* (Gray). Hyderabad (Inde). S. S. Simha *leg.*

FROM DOLLFUS AND SIMHA, 1964

— OVER —

Astiotrema reniferum (Looss, 1898) Stossich, 1904. (Figs. 1 and 2).

DESCRIPTION: Body lanceolate, 2.19-3.08 long by 0.37-0.60 wide. Living specimens extremely mobile and capable of great elongation and contraction. Cuticle armed anteriorly with numerous spines measuring up to 7 microns long; spines become sparse and smaller in region of ventral sucker. Oral sucker, 0.19-0.23 long by 0.19-0.22 wide, subterminal; prepharynx variable, up to 0.12 long in relaxed specimens; pharynx 0.09-0.12 long by 0.08-0.13 wide; oesophagus 0.09-0.18 long; intestinal caeca extend, posteriorly, to level midway between posterior testis and posterior body margin. Ventral sucker, 0.21-0.24 long by 0.19-0.22 wide, almost equal in size to oral sucker and situated at one third of body length. Testes rounded, tandem, in posterior half of body. Anterior testis, 0.16-0.24 long by 0.12-0.19 wide; posterior testis 0.19-0.31 by 0.15-0.19. External seminal vesicle absent. Cirrus sac elongate, 0.26-0.50 long by 0.09-0.11 in maximum diameter. Cirrus sac curves round to left or right of ventral sucker and contains folded internal seminal vesicle, 0.12-0.26 long by 0.05-0.08 wide, elongate pars prostatica and ejaculatory duct. Common genital pore median or submedian, immediately in front of ventral sucker. Ovary, 0.12-0.18 long by 0.12-0.15 wide, lies on left side of body just behind cirrus sac. Receptaculum seminis, 0.06-0.12 long by 0.06-0.12 in diameter, lies immediately posterior to ovary. Mehlis' gland diffuse, situated to right of ovary and receptaculum seminis. Uterus with descending and ascending limbs, extends to posterior margin of body and, in mature specimens fills all available post-testicular space. Vitelline follicles, irregular in outline, up to 0.08 in diameter, extend from level of ventral sucker to level of posterior margin of posterior testis. Excretory vessel, clearly visible in living material, Y shaped. Eggs numerous, operculate, 35-39 microns long by 18-21 microns wide.

HOST: *Clarias mossambicus* Peters.

LOCATION: Posterior region of intestine.

LOCALITY: Mazoe, Southern Rhodesia and Bangweulu Swamps, Northern Rhodesia.

DISCUSSION: After a preliminary examination, with reference to Yamaguti (1958), the material from Mazoe was assigned to two genera; *Astiotrema* Looss, 1900 (Fig. 1) and *Gauhatiana* Dayal and Gupta, 1953 (Fig. 2). Yeh and Fotedar (1958) reviewed the genus *Astiotrema* and synonymised the genus *Gauhatiana* Gupta, 1955* with *Astiotrema* Looss, 1900. The present author is in complete agreement with this proposal.

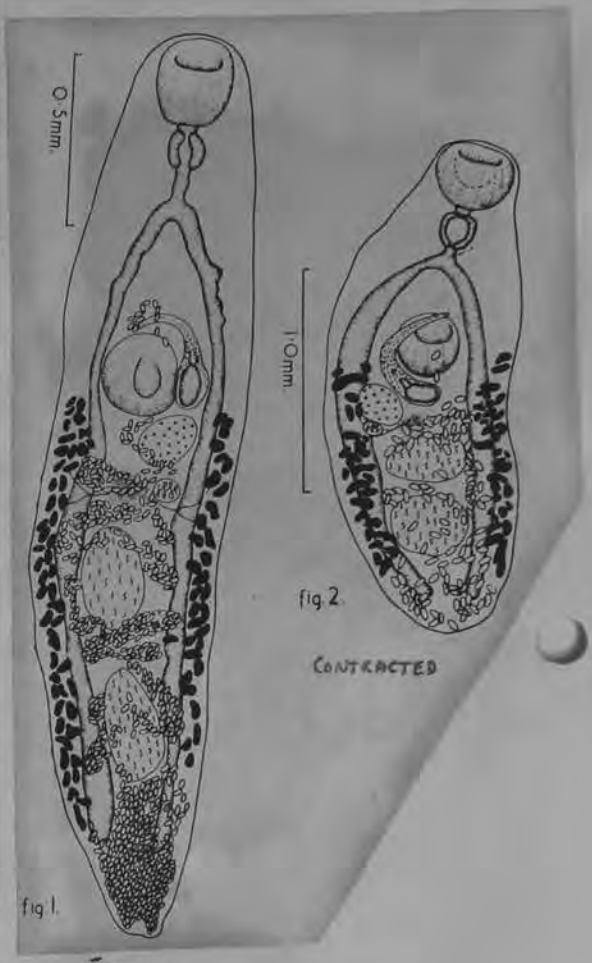
Yeh and Fotedar (1958) list twenty one species which have been assigned to the genus *Astiotrema* but only accept four of these as valid viz: *A. reniferum* (Looss, 1898), *A. impletum* (Looss, 1899), *A. monticellii* Stossich, 1904 and *A. odhneri* Bhalerao, 1936. Of these *A. reniferum* (sensu Yeh and Fotedar, 1958) and *A. impletum* have been recorded from fish. Yeh and Fotedar (1958) give a revised diagnosis of the genus *Astiotrema* and also a key to the four recognised species. The present material is easily identified as *Astiotrema reniferum* and has similar measurements to the smaller specimens described by Yeh and Fotedar (1958).

A. reniferum has not previously been recorded from *Clarias mossambicus* and is a new record for Southern Africa. As is shown in Table 1, *A. reniferum* has been found frequently in the Mazoe area (from several dams). *C. mossambicus* can travel overland during the rainy season so that it is probable that *A. reniferum* is a widely distributed species.

Table 1. Illustrating the numbers of *Clarias mossambicus* and *C. mellandi* found to be infected with the trematodes described in the present paper.

	Mazoe		*Gatooma*		*Bangweulu Swamps*	
	Total Examined	Infected	Total Examined	Infected	Total Examined	Infected
Astiotrema reniferum						
C. mossambicus	28	21	4	0	11	2
C. mellandi	0	0	0	0	2	0
Allocreadium mazoensis n.sp.						
C. mossambicus	28	2	4	0	11	0
C. mellandi	0	0	0	0	2	0
Orientocreadium batrachoides						
C. mossambicus	28	19	4	4	11	6
C. mellandi	0	0	0	0	2	2
Eumasenia bangweulensis n.sp.						
C. mossambicus	28	0	4	0	11	0
C. mellandi	0	0	0	0	2	1

*According to Helminthological Abstracts Volume 22, Dayal & Gupta (1953) proposed the genus *Gauhatiana* in abstract. Subsequently Gupta (1955) described the type species *Gauhatiana batrachii*, n.g., n.sp. in detail—hence the discrepancy.



FROM BEVERLEY-BURTON, 1962

Plagiorchidae (from Agrawal, 1966)

ASTIOTREMA RENIFERUM (Looss, 1898) Stossich, 1904

(Pl. III, fig. 1)

Only one specimen of this form was collected from the intestine of a fresh water fish, *Heteropneustes fossilis* (Bloch.) at Lucknow.

Description :

Body elongated with rounded extremities, 2.54 × 0.452 mm. in size. Cuticle covered with small backwardly directed spines arranged in transverse rows. Spines become progressively denser on anterior surface ; spines of each row alternating with preceeding and succeeding rows. Oral sucker terminal, subspherical, 0.14 × 0.15 mm. in size. Prepharynx absent ; pharynx large, spherical, 0.1 mm. in diameter ; esophagus long, tubular, 0.28 mm. in length, bifurcating into two intestinal ceca reaching short of posterior extremity. Ventral sucker oval, larger than oral sucker, 0.16-0.19 mm. in size at 0.65 mm. or about 1/4th of body length from anterior extremity.

Genital pore submedian, lying infront of ventral sucker at 0.63 mm. from anterior extremity.

Excretory pore at hind end of body. Excretory bladder Y-shaped, main stem passes in between two testes in form of a sigmoid curve divided into two short arms between ovary and anterior testis.

Testes entire, oval lying obliquely one behind other in posterior half of body just behind equator. Anterior testis, 0.18 × 0.16 mm. in size at 1.29 mm. from anterior extremity. Posterior testis slightly larger than anterior testis, 0.17 × 0.19 mm. in size at 0.724 mm. from hind end of body. Cirrus sac claviform, elongated reaching upto ovary, 0.94 × 0.09 mm. in size. Vesicula seminalis large occupies a greater portion of cirrus sac, 0.45 × 0.09 mm. in size. Pars prostatica long, tubular, 0.14 × 0.02 mm. in size, continues forward as an ejaculatory duct, 0.27 mm. in length, opening at genital pore. Cirrus muscular and non spiny.

Ovary entire, spherical, preequatorial, 0.08 mm. in diameter at 1.1 mm. from anterior extremity. Oviduct arises from hind end of ovary opening at oötype. Receptaculum seminis slightly larger than ovary and its left side, 0.085 mm. in diameter. Vitellaria small, follicular, mainly lateral covering intestinal ceca extending from hind margin of ventral sucker upto middle region of hind testis. Uterus arises from oötype and runs posteriorly in a sinuous course towards posterior end, passes anteriorly to left of cirrus sac opening at genital pore. Eggs oval, non operculated, 0.0245-0.0355 × 0.0112-0.0195 mm. in size.

Discussion :

The present form belongs to *A. reniferum* (Looss, 1898), Stoss, 1904 which has not previously been recorded from a fresh water fish, *Heteropneustes fossilis*. The present form differs from other descriptions of *A. reniferum* in the possession of spines on the body wall, in the absence of prepharynx and in having vesicula seminalis S shaped. These differences are considered as variations within the species.

Location : Intestine.

Locality : Lucknow.

Host : *Heteropneustes fossilis* (Bloch.).

Family: PLAGIORCHIDAE Lühe, 1901, emend. Ward, 1917
Subfamily: Plagiorchiinae Pratt, 1902
Genus: *Astiotrema* Looss, 1900

Astiotrema reniferum (Looss, 1898) Loos, 1900
(Figs. 1-10)

A large number of specimens of this form were collected from the intestine of a single host *Kachuga dhongoka* (Gray) at Lucknow.

DESCRIPTION: Body elongate, spinose; hindbody somewhat broader than forebody with rounded extremities. Is measures 1.40 to 3.85 mm in length and 0.42 to 1.66 mm in maximum width in the region of anterior testis. Oral sucker subterminal, ovoid, 0.11 to 0.17 × 0.11 to 0.22 mm in size. Prepharynx small and thin-walled; pharynx ovoid or globular, 0.03 to 0.13 × 0.05 to 0.17 mm in size; esophagus long, tubular, 0.14 to 0.60 mm in length; intestinal ceca simple running along sides of body up to anterior end of hind testis or to some distance anterior to caudal end. The posterior extension of intestinal ceca varies in different specimens. In some specimens ceca are equal while in others right intestinal cecum is larger or smaller than left one. Ventral sucker spherical or ovoid equal to, smaller or larger than oral sucker, 0.16 to 0.30 × 0.11 to 0.28 mm in size and lying at 0.40 to 0.83 mm from anterior extremity.

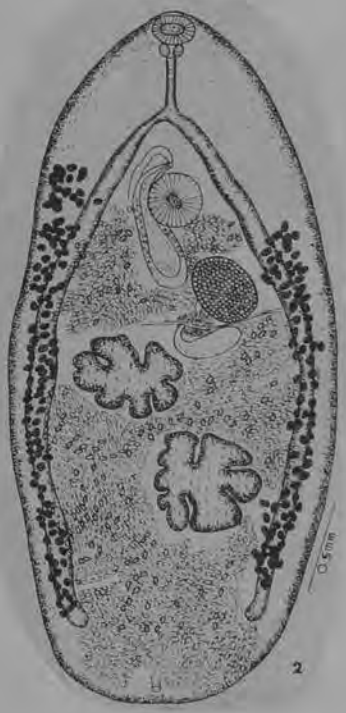
Genital pore preacetabular, median or submedian at 0.39 to 0.82 mm from anterior extremity. Excretory pore terminal. Excretory bladder Y-shaped, median stem passing between two testes in a sigmoid curve divided into two short arms between ovary and anterior testis.

Testes entire, spherical or deeply lobed, diagonal and intercaecal; anterior testis equatorial or postequatorial. The shape and nature of testes are subject to much variation. Anterior testis equal to, or smaller or larger than posterior testis, lying anterior to left intestinal cecum, 0.16 to 0.55 × 0.18 to 0.36 mm in size at 0.60 to 2.6 mm from anterior end. Posterior testis situated on right side touches intestinal cecum, 0.16 to 0.59 × 0.18 to 0.39 mm in size at 0.19 to 1.9 mm from hind end of body. Cirrus pouch claviform, elongated, 0.39 to 1.0 mm in size lying dorsal to ventral sucker on right side of it, extending far beyond acetabulum as far as ovary. Vesicula seminalis an elongated sac occupying basal part of cirrus sac, 0.20 to 0.39 × 0.12 to 0.15 mm in size; pars prostatica tubular, 0.04 to 0.06 × 0.05 to 0.06 mm in size; ejaculatory duct, 0.16 to 0.22 mm long opening at genital pore.

Ovary submedian, postequatorial, lobed or entire, lying on right or left side at postero-lateral margin of ventral sucker measuring 0.13 to 0.36 × 0.09 to 0.30 mm in size at 0.6 to 1.42 mm from anterior extremity. From its postero-lateral side arises oviduct which opens at oötype. Receptaculum seminis a large sac, 0.06 to 0.11 × 0.11 to 0.8 mm in size, lying obliquely or transversely between ovary and anterior testis. Vitellaria small, follicular, extracaecal but at places overlapping ceca, extending from level of ventral sucker up to hind end of anterior testis or a little anterior to hind end of body. Posterior extension of vitellaria either equal or left side larger than that of right side. Vitelline ducts of both sides meet behind posterior margin of ovary to form a common duct opening at oötype Uterus arises from posterior side of oötype and runs posteriorly between two testes up to hind end of body. Terminal part of ascending limb extends close to left intestinal cecum to open at genital pore. Eggs oval and operculate, 0.021 to 0.031 × 0.012 to 0.015 mm in size.

HOST: *Kachuga dhongoka* (Gray).
LOCATION: Intestine.
LOCALITY: Lucknow.

1



2

DISCUSSION: The genus *Astiotrema* Looss, 1900 according to published works contains 26 especies reported from different parts of the World. They are: *Astiotrema reniferum* (Looss, 1898) Looss, 1900, type species; *A. impletum* (Looss, 1898) Looss, 1900; *A. monticelli* Stossich, 1904; *A. emydis* Ejsmont, 1930; *A. elongatum* Mehra, 1931; *A. loossi* Mehra, 1931; *A. gangeticus* Harshey, 1932; *A. spinosa* Chatterji, 1933; *A. indica* Thapar, 1933; *A. rami* Bhalerao, 1936; *A. odhneri* Bhalerao, 1936; *A. orientale* Yamaguti, 1937; *A. amydae* Ogata, 1938; *A. fukui* Ogata, 1938; *A. dassia* Dayal, 1938; *A. foochowensis* Tang, 1941; *A. nathi* Gupta, 1954; *A. hoshiarpurium* Gupta, 1954; *A. srivastavai* Gupta, 1954; *A. thapari* Gupta, 1954; *A. matthaii* Gupta, 1954; *A. geomydis* Siddiqui, 1958; *A. giganticum* Tewari, 1958; *A. lobiorchis* Tewari, 1958; *A. mehrai* Tewari, 1958; *A. sudanensis* Khalil, 1959; *A. tritumi* Gabda, 1959 and *A. cyclemysi** Siddiqi, 1965.

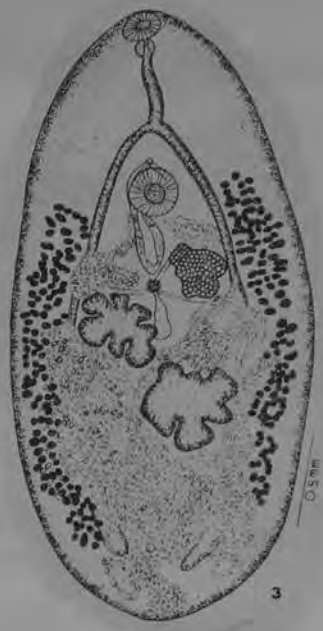
BHALERAO (3) synonymised *A. gangeticus* to *A. loossii*. GUPTA (6) synonymised *A. amydae* and *A. foochowensis* to *A. orientale*. YEH and FOTEDAR (17) in a comprehensive review of the genus *Astiotrema* transferred *A. emydis* to *Leptophallus* and considered *Gauhatiana* Gupta, 1953 to be congeneric with *Astiotrema*. They recognised the following forms as valid species with their synonyms:

1. *A. reniferum* (Looss, 1898) Looss, 1900 (Syns. *A. elongatum* Mehra, 1931; *A. loossii* Mehra, 1931; *A. gangeticus* Harshey, 1932; *A. spinosa* Chatterji, 1933; *A. indica* Thapar, 1933; *A. rami* Bhalerao, 1936; *A. dassia* Dayal, 1938; *A. hoshiarpurium* Gupta, 1954; *A. thapari* Gupta, 1954 and *Gauhatiana hatrachii* Gupta, 1954); 2. *A. impletum* (Looss, 1898); 3. *A. monticellii* Stossich, 1904; 4. *A. odhneri* Bhalerao, 1936 (Syns. *A. orientale* Yamaguti, 1937; *A. amydae* Ogata, 1938; *A. fukui* Ogata, 1938; *A. foochowensis* Tang, 1941; *A. nathi* Gupta, 1954; *A. srivastavai* Gupta, 1954 and *A. matthaii* Gupta, 1954).

YEH and FOTEDAR (17) distinguished these species from each other on the basis of the following characters: (i) the relative length of caeca, (ii) the ratio of suckers and (iii) the distribution of vitellaria. BURTON (4) is in complete agreement with this proposal. KHALIL (7) synonymised *A. odhneri* with *A. reniferum* on the basis of the variability in the extent of caeca observed in the specimens collected in Sudan from a fresh water turtle. AHLUWALIA (1) considered *A. geomydis* to be a synonym of *A. impletum*. SIDDIQI (11) considered *A. lobiorchis* and *A. mehrai* to be synonyms of *A. reniferum*.

The author does not agree with YEH and FOTEDAR (17) and considers that the relative length of ceca and ratio of suckers are variable characters and of little specific importance. In the author's specimens oral sucker is smaller, equal or larger than ventral sucker and intestinal ceca extend up to hind end of anterior testis or up to a little beyond hind end of hind testis. YEH and FOTEDAR (17) ufortunately distinguished *A. reniferum* and *A. odhneri* on the basis of relative length of ceca, considering it to be a useful character. From the above facts it is evident that the differential characters suggested by Yeh and Fotedar are variable and thus unacceptable. Hence the author is in favour of KHALIL, (7) in considering *A. odhneri* Bhalerao, 1936 to be a synonym of *A. reniferum*.

The author does not agree in transferring *A. emydis* to *Leptophallus* nor in holding *Gauhatiana* to be congeneric with *Astiotrema*. The form *A. emydis* is easily distinguished from *Leptophallus* on the nature of vitellaria and on the position of cirrus pouch. The genus *Gauhatiana* is distinct from the genus *Astiotrema* in having vitellaria into two distinct aggregations. The anterior follicles lie on each side of the esophagus anterior to intestinal bifurcation and posterior follicles on the lateral sides of the body from behind the ventral sucker to posterior region of hind testis.

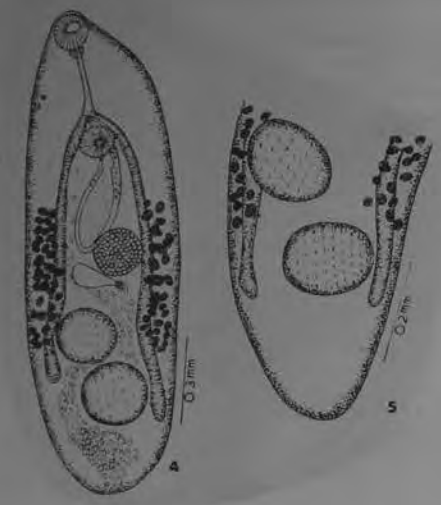


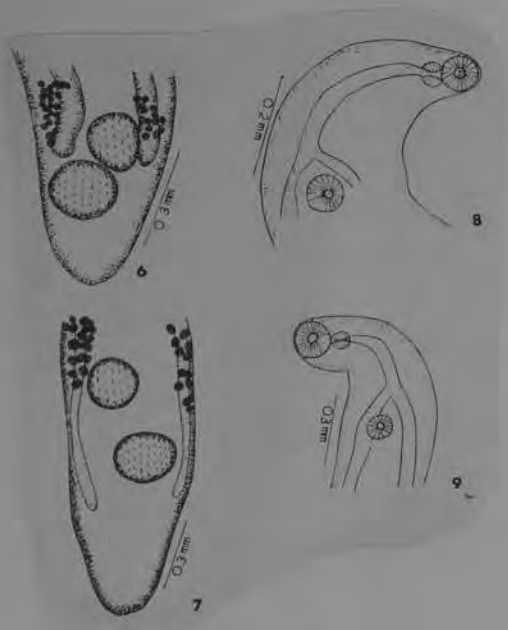
3

TEWARI (13) distinguished *A. giganticum*, *A. lobiorchis* and *A. mehrai* from other species of *Astiotrema* on the shape of testes, relative size of suckers, extension of vitellaria, shape of ovary and size of receptaculum seminis. It is my experience from the collection of *Astiotrema* that the minor differences pointed out by Tewari except the extension of vitellaria are too variable and of no importance. Accordingly all the three species fall into synonymy with *A. reniferum*. Further the author is of the opinion that *A. irituri* and *A. sudanensis* are synonyms of *A. reniferum*, as the differences pointed out are variable characters. Therefore the genus *Astiotrema* at present comprises the following five species, viz. *A. reniferum*, *A. impletum*, *A. monticellii*, *A. emydis* and *A. cyclemydis*.

* *Astiotrema cylemiti* Siddiqi, 1965 contains an error in the Latin composition of the genitive. It should be treated as *Astiotrema cyclemydis*.

Astiotrema reniferum (Looss, 1898) Loos, 1900





Astiotrema amydae Ogata, 1938

(Рис. 104)

Хозяева: черепахи — *Amyda maackii*, *Amyda sinensis*.

Локализация: кишечник.

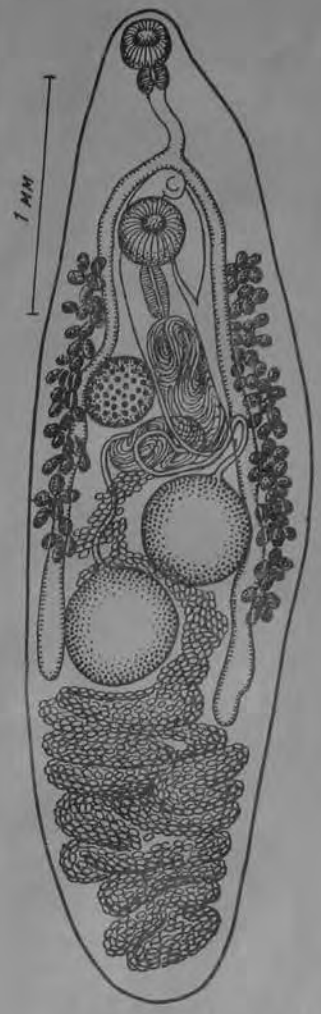
Места обнаружения: Япония и СССР (озеро Ханка).

Историческая справка. В 1938 году японский гельминтолог Огата (Ogata) описал новую трематоду *Astiotrema amydae* из кишечника *Amyda maackii*.

В нашем распоряжении не было оригинальной работы этого исследователя.

Вторично этот вид был найден и изучен советским гельминтологом Белоус (1954) у черепах *Amyda sinensis*, пойманных на озере Ханка Приморского края. Белоус исследовала 93 черепахи этого вида, причем они оказались инвазированными *Astiotrema amydae* на 100%. Количество трематод, паразитировавших в одной черепахе, доходило до 500 экземпляров.

Описание вида (по Белоус, публикуется впервые). Тело сильно сплющено в дорзо-вентральном направлении и вогнуто на вентральную сторону. По внешнему виду сильно напоминает трематод *Cephalogonimus emydalis*, с которыми постоянно встречается вместе. Длина тела 4,200 мм, наибольшая ширина 1,100 мм. Ротовая присоска 0,215 мм в диаметре, расположена субтерминально. Брюшная присоска находится в первой четверти длины тела: она больше ротовой; диаметр ее



104

Astiotrema dassia Dayal, 1938

Хозяин: рыба — *Clarias batrachus.*

Локализация: кишечник.

Место обнаружения: Индия.

Описание вида нами не приводится из-за отсутствия в нашем распоряжении литературных источников.

Astiotrema elongatum Mehra, 1931

(Рис. 105)

Хозяин: черепаха — *Trionyx gangeticus*.

Локализация: тонкие кишки.

Место обнаружения: Индия.

Описание вида (по Мэра, 1931). Тело удлиненное, эллипсоидной формы, достигает 9—12 мм длины. Ширина варьирует в разных частях тела, причем наибольшей ширины оно достигает 2,1—3,0 мм в области яичника. Передний и задний концы тела несколько закругленные, особенно задний, который всегда шире переднего. Тело кпереди от переднего семенника покрыто мелкими остроконечными чешуйками 0,0204 мм длины и 0,0078 мм ширины в области кишечной бифуркации. Вокруг ротовой присоски чешуйки многочисленны, лежат более плотно и достигают меньшей длины. Присоски почти шарообразные. Ротовая присоска крупнее брюшной, достигает 0,49—0,62 мм в диаметре. Брюшная присоска 0,36—0,53 мм в диаметре, расположена на расстоянии 2,42—3,06 мм от переднего конца тела. Половые отверстия лежат непосредственно впереди брюшной присоски, немного влево от медианной линии тела. Префаринкс имеется. Фаринкс более или менее шаровидный, 0,26—0,33×0,32—0,37 мм. Пищевод в $1^1/_2$—3 раза длиннее фаринкса. Кишечная бифуркация находится почти посередине между присосками. Кишечные ветви идут более или менее прямо и заканчиваются на середине между задним семенником и задним концом тела; концы кишечных ветвей направлены друг к другу.

Семенники крупные, расположены один позади другого на расстоянии 0,6—1,3 мм один от другого в задней половине тела, между кишечными стволами. Передний семенник яйцевидной формы лежит медианно и несколько влево, достигая 1,3—1,35 мм длины и 0,9—1,12 мм максимальной ширины. У него несколько неровные края, которые, однако, нельзя рассматривать как лопастные. Задний семенник с гладкими краями, несколько сдвинут вправо, имеет форму широкого треугольника с верхушкой, направленной вперед; размер его 1,3—1,35 мм длины и 0,8—1,2 мм ширины.

Половая бурса крупная, заходит далеко за брюшную присоску, достигая уровня яичника; длина бурсы 1,08—1,46 мм, максимальная ширина 0,37—0,46 мм. Занимает она более или менее медианное положение, продольная ось параллельна длине тела, тонкая конечная часть плотно огибает брюшную присоску и открывается дорзально от ее правого края. Основная часть половой бурсы грушевидной формы, имеет толстую стенку с продольными мышечными волокнами; мускульная стенка трубчатой ча-

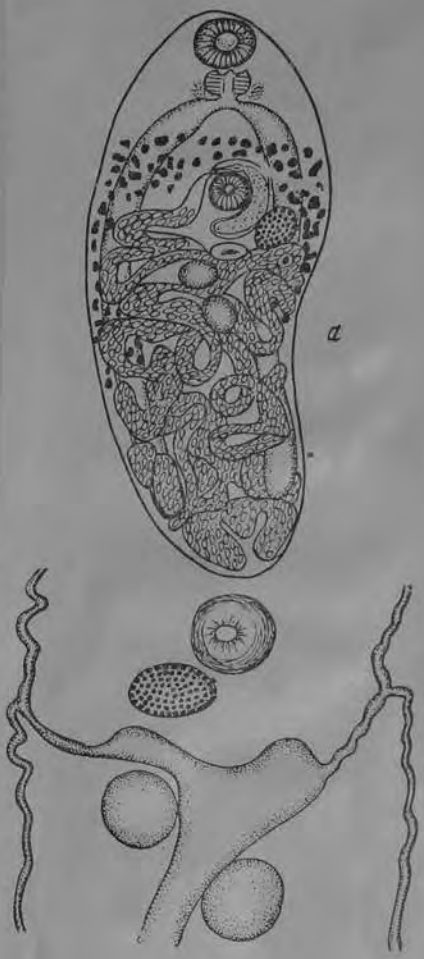
105

Astiotrema emydis Ejsmont, 1930

(Рис. 106—106а)

Хозяин: европейская водяная черепаха — *Emys orbicularis*.
Локализация: желудок, иногда дуоденум.
Место обнаружения: Польша.

106 а



106

106а. *Astiotrema emydis* Ejsmont, 1930 (по Модржеевской, 1938)

Astiotrema foochowensis Tang, 1941

(Рис. 107)

Хозяин: пресноводная черепаха — *Amyda tuberculata*.

Локализация: кишечник.

Место обнаружения: Китай.

Описание вида (по Тангу, 1941). Тело эллипсоидное, достигает 5 мм длины и 1,21 мм ширины; передний и задний концы закругленные; наибольшая ширина в задней части тела. Кутикула покрыта остроконечными шипиками, расположенными в виде поперечных рядов, причем шипики каждого ряда перемежаются с предыдущим и последующим рядами.

Размер шипиков постепенно уменьшается, и они исчезают к заднему концу тела. Ротовая присоска 0,249 × 0,209 мм диаметром, расположена субтерминально. Префаринкс отсутствует. Круглый фаринкс достигает 0,090 × 0,104 мм. Пищевод 0,498 мм длины, у сокращенных экземпляров много короче. Кишечник бифурцирует впереди брюшной присоски, а его слепые ветви заканчиваются на уровне заднего края заднего семенника. Семенники крупные, округлые, расположены наискось один позади другого в третьей четверти длины тела. Половая бурса большая, простирается до переднего края яичника, достигает 1,054 мм длины и 0,207 мм ширины.

107

Astiotrema fukuii Ogata, 1938

Хозяин: черепаха — *Amyda maackii*.
Локализация: кишечник.
Место обнаружения: Япония.
Описания вида мы не приводим из-за отсутствия в нашем распоряжении литературных материалов.

Z. f. Parasitenkunde, Bd. 18, S. 219—222 (1958)

Aus dem Zoologischen Institut der Aligarh Muslim Universität, Aligarh, U. P. (India) (Direktor: Prof. Dr. M. R. Mirza), Department of Zoology

ON A NEW TREMATODE, *ASTIOTREMA GEOMYDIA* (FAMILY PLAGIORCHIDAE), FROM AN INDIAN TORTOISE

By

Wasim Ahmad Siddiqui

With 1 Figure in the Text

(Eingegangen am 24. Mai 1957)

1. Introduction

Looss (1898) described a trematode from the intestine of a turtle, *Trionyx nilotica*, as *Distomum reniferum*. Later (1899), while reviewing the genus *Distomum* of Retzius (1782), he described a new form, *Astia impleta*, from the intestine of *Tetrodon fahaka* and transfered his former species, *Distomum reniferum*, to this new genus as its type species. In 1900 he changed the generic name *Astia* to *Astiotrema* and placed both of his species, *Distomum reniferum* and *Astia impleta* in this genus. These were thus named as *Astiotrema reniferum* Loos and *Astiotrema impletum* Looss. Stossich (1904) described a third species, *Astiotrema monticellii*, from the intestine of *Tropidonotus viviparinus* which was formerly described wrongly as *Distomum signatum* by Monticelli (1891). Looss (1900) also transfered *Distomum erinaceum* Poirier to the genus *Astiotrema*. But Odhner (1911) excluded the latter species from the genus *Astiotrema*, saying that it belonged to the Monostomidae as *Galactosomum lacteum* (Jägerskiold 1896) or a closely related form. He also described two trematodes from the intestine of *Trionyx triunguis* and *Tretradon fahaka* as *Astiotrema reniferum* and *Astiotrema impletum* respectively.

Mehra (1931) added two new species to this genus, *Astiotrema elongatum* from the intestine of *Trionyx gangeticus* and *Astiotrema loossii* from the small intestine of *Kachuga dhongoka*.

Harshe (1932) added another species, *Astiotrema gangeticus*, from *Emyda granosa*. Chatterji (1933) described a new species, *Astiotrema spinosa*, from the stomach and intestine of *Clarias batrachus*. Thapar (1933) added one more species, *Astiotrema indica* from the intestine of a tortoise, *Chitra indica*.

Bhalerao (1936) thought that the worm described by Odhner (1911) from *Trionyx triunguis* was not *Astiotrema reniferum* due to differences in the length of the intestinal caeca, the shape of the testes and the position of the ovary and the vitellaria from the original of this species as described by Looss (1900). He called this worm *Astiotrema*

odhneri. He made *Astiotrema gangeticus* Harshe (1932) a synonym of *Astiotrema loossii* Mehra (1931). He also described a new species, *Astiotrema rami*, from the intestine of *Lissemys punctata*. — The present work deals with an account of another new species of the genus obtained at Aligarh, (U. P.), India, from the intestine of a tortoise *Geomyda spinosa*. It has been named aas *Astiotrema geomydia* n sp.

2. Astiotrema geomydis n. sp. Siddiqui, 1958

Ten specimens of this species were obtained in 1956 from the intestine of *Geomyda spinosa* at Aligarh. Out of the twelve tortoises examined only one was found to be infected with this species.

The body of the parasite is elongated, and flattened dorso-ventrally. It measures 1.55 to 1.65 mm in length and 0.22 to 0.38 mm in width. The maximum width is in the region of anterior testis. The body is covered all over its surface by short spines and is rounded at both ends.

The suckers are more or less spherical. The oral sucker is larger than the ventral sucker. The oral sucker measures 0.065 to 0.075 mm and ventral sucker 0.04 to 0.045 mm in diameter. The latter is situated at a distance of 0.21 mm from the anterior end of the body.

The mouth is situated in the centre of the oral sucker and leads into a short pre-pharynx. The pharynx is globular in shape and measures 0.05 mm in diameter. It then leads into a short oesophagus measuring 0.06 mm in length. The bifurcation of the intestinal caecae is situated at a distance of 0.04 mm anterior to ventral sucker. The intestinal caecae run along the sides of the body and terminate at a distance of 0.4 to 0.42 mm from its posterior end. — The excretory pore is situated at the extreme posterior end of the body. The genital opening lies just in front of the ventral sucker.

There are two testes more or less spherical in shape. The anterior testis measures 0.19 to 0.2 mm in diameter and lies in the middle part of the body. The posterior testis lies in the posterior half of the body at a distance of 0.16 mm behind the anterior testis and measures 0.18 to 0.19 mm in diameter. The cirrus sac is large and club-shaped and measures 0.36 to 0.37 mm in length and 0.08 to 0.1 mm in width. It extends far behind the ventral sucker and reaches upto the posterior end of the ovary. The seminal vesicle occupies the larger part of the cirrus sac. The pars prostatica and cirrus are appreciably small.

The ovary is situated on the right side of the animal at a distance of 0.21 mm from the ventral sucker. The ovary is more or less rounded in shape and measures 0.09 to 0.1 mm in diameter. The receptaculum seminis immediately lies behind the ovary and is much larger than the latter. It measures 0.2 mm × 0.17 mm. The LAURER's canal is present.

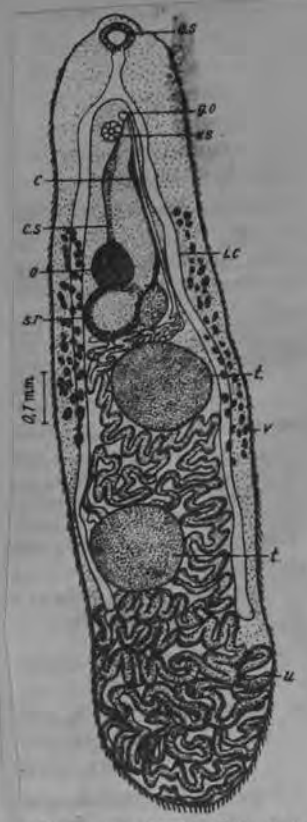


Fig. 1. *o. s* Oral sucker, *g. o* Genital opening, *v. s* Ventral sucker, *c* Cirrus, *c. s* Cirrus sac, *i. c* Intestina caeca, *o* Ovary, *s. r* Seminal receptaculum, *t.* Testis, *v* Vitellaria, *u* Uterus

The shell gland is found opposite to the receptaculum seminis and is partly eclipsed by the latter.

The vitellaria are follicular and are placed laterally on either side of the body. The mass of the vitelline glands mainly occupies the space outside the caecae and only partly overlap them, both dorsally and ventrally. The vitellaria are situated more or less in the middle third of the body. It extends from the posterior end of the ventral sucker to the level of the anterior end of the posterior testis.

The uterus arises from the ootype and then coils backwards into a descending limb to the posterior end of the body and then extends forwards into an ascending limb. The uterine coils are very dense and occupy all the space below the ovary except that occupied by the testes and the vitellaria. The metraterm lies on the left of the cirrus sac and opens into the genital atrium.

The ripe ova are oval in shape and have a yellowish brown shell, measuring 0.03 to 0.035 mm in length and 0.01 to 0.12 mm in width.

3. Discussion

Astiotrema geomydia is characterised by the elongated dorso-ventrally flattened shape of the body, the reduction in the size of the suckers, presence of the genital opening just anterior to the ventral sucker, spherical shape of the testes, a larger cirrus sac, position of the ovary which is situated at about the middle distance between the ventral sucker and middle of the body and disposition of the vitellaria which extend from the level of the cirrus sac to the anterior end of the posterior testis.

Astiotrema geomydia very closely resembles *Astiotrema rami* BHALERAO (1936), but it differs from it in the following points: In *A. rami* the anterior end of the body is broader than the posterior end as shown in the figure 1 given by BHALERAO (l. c.) while in *A. geomydia* the posterior end is slightly broader than the anterior end. Further *A. rami*

is larger in overall size of its body as compared with *A. geomydia*. The suckers of the latter species are smaller in size as compared to those of the former. They measure 0.04 to 0.075 mm and 0.16 to 0.35 mm in diamater respectively. The size of the cirrus sac in relation to the overall size of the body in *A. rami* is smaller than that of the present species. The ovary in *A. geomydia* lies at about the middle distance between the ventral sucker and the middle of the body while in *A. rami* it is nearer the ventral sucker. Further in *A. rami* the vitellaria anteriorly reach the level of the posterior edge of the ventral sucker while in *A. geomydia* they end much behind it, at about the middle of the cirrus sac. — The author feels that the obove differences are enough to justify the creation of a new species for which the name, *Astiotrema geomydia* is proposed.

Host: *Geomyda spinosa*. *Location*: Intestine. *Locality*: Aligarh (U. P.), India. — The type slide has been deposited in the Helminthological Collection of the Zoology Museum of the Muslim University, Aligarh (U. P.) India.

4. Key to the species of the genus Astiotrema

1.	Oral sucker equal to ventral sucker	*A. indica*
	Oral sucker smaller than the ventral sucker	7
	Oral sucker larger than the ventral sucker	2
2.	Intestinal bifurcation posterior to ventral sucker	*A. monticelli*
	Intestinal bifurcation anterior to ventral sucker	3
3.	Vitellaria terminating at middle of anterior testis	*A. impletum*
	Vitellaria terminating behind the anterior testis	4
4.	Intestinal caeca not passing behind posterior testis	*A. odhneri*
	Intestinal caeca passing behind posterior sucker	5
5.	Vitellaria extending anterior to ventral sucker	*A. elongatum*
	Vitellaria not extending anterior to ventral sucker	6
6.	Ovary near the mid-body, testes kidney shaped	*A. reniferum*
	Ovary near the ventral sucker, testes rounded or irregular	*A. rami*
	Ovary at middle of ventral sucker and mid-body, testes spherical	*A. geomydia*
7.	Testes deeply lobed	*A. loossii*
	Testes rounded	*A. spinosa*

ASTIOTREMA GIGANTICUM, ~~sp.~~ Tiwari, 1958

A large number of these trematodes were obtained from the intestine of *Trionyx gangeticus*. The worms are dorsoventrally flattened with rounded anterior and posterior ends, measuring 10·0-12·5 mm. in length and 2·35-2·96 mm. in maximum breadth in the region of the anterior testis. The body is studded with small spines which are more closely arranged in the anterior half and become sparse posteriorly.

The oral sucker is subterminal in position and measures 0·37-0·47 mm. in diameter. The ventral sucker is larger than the oral sucker measuring 0·44-0·50 mm. in diameter and is placed at a distance of 1·33-1·93 mm. from the anterior end. The prepharynx is very small. The pharynx measures 0·09-0·23 × 0·28-0·30 mm. The oesophagus is 0·35-0·70 mm. in length and 0·07-0·19 mm. in breadth. The intestinal bifurcation lies at a distance of 0·91-1·90 mm. from the anterior end. The intestinal caeca terminate slightly infront of the posterior end of the body and have slightly crenated outermargins near the intestinal bifurcation.

The excretory pore lies at the posterior end of the body and leads into a Y shaped bladder, the median stem of which extends beyond the anterior testis.

The two testes lie in the posterior half of the body placed one behind the other between the intestinal caeca. The anterior testis measures 0·76-1·14 mm. in length and 1·52-1·78 mm. in breadth. The posterior testis measures 1·02-1·33 mm. in length and 1·52-1·82 mm. in breadth and is placed at a distance of 0·76-1·12 mm. from the posterior margin of anterior testis. Both the testes are lobulated having 6-7 obes with a deep notch infront, from where arise the vasa efferentia. The vasa efferentia join to from a small vas deferens at the base of the cirrus sac. The vas efferens from the posterior testis lies on the left and that from the anterior testis on the right side of the median line.

The cirrus sac is a large sac extending far beyond the acetabulum as far as the ovary. It is broad oval in its basal part and becomes tubular terminally. It is 1·50-2·28 mm. in length and 0·63-0·74 mm. in breadth. The vesicula seminalis occupies the basal part and the parsprostatica and the cirrus occupy the terminal part of the cirrus sac. The genital pore is situated just above the ventral sucker slightly to the right of the median line.

The subspherical ovary is situated on the left side close to the left intestinal caecum at a distance of 2·96-4·18 mm. from the anterior end and measures 0·46-0·57 mm. in length and 0·51-0·56 mm. in breadth. From its postero-lateral aspect arises the oviduct which after a short course receives the duct of the receptaculum seminis and the laurer's canal. The octype is situated on the right side of the ovary in the median line. The receptaculum seminis is a large sac, semilunar in shape located betwen the ovary and the anterior testis. The receptaculum seminis is transversely disposed and measures 0·98-1·19 mm. in length and 0·68-0·77 mm. in breadth.

The vitelline follicles are arranged in groups along the two sides of the body. They extend from the level of the neck of the cirrus sac to the level of the middle region of the posterior testis. The lateral vitelline ducts anterior and posterior lead into transverse ducts behind the posterior margin of the ovary.

The uterus arises from the right side of the ootype. Its desceading and ascending coils pass between the two testes and extend upto the posterior end of the body. The metraterm runs along the cirrus sac and opens into the genital artium.

The eggs are oval in shape and measure 0·03-0·036mm. in length and 0·015-0·018mm. in breadth.

Plagiorchiidae

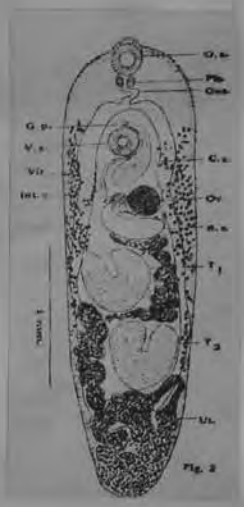
N. K. GUPTA, 1954

Astiotrema hoshiarpurium, ~~n.sp.~~ (Fig. 2.)

Host .. .. *Lissemys punctata punctata.*
Location .. Intestine.
Locality .. Hoshiarpur (India).

Only two specimens of *Astiotrema hoshiarpurium*, n.sp. were got fro the intestine of a tortoise caught from one of the streams at Hoshiarpu The parasite is elongated in shape with the anterior end more broad rounded than the posterior end. In one of the specimens there is a slig protuberance at the anterior extremity. The body is 3·24–4·88 mm. length and 1·32–1·40 mm. in its maximum breadth round the region j in front of the anterior testis. The cuticle is covered with small spi arranged in transverse rows. The rows of spines are more closely towards the anterior end as compared to the posterior end. They can best seen in the living specimens.

The subterminal oral sucker measures 0·238–0·255 mm. in length a 0·204–0·289 mm. in breadth and is larger than the ventral sucker whi measures 0·204–0·238 mm. long and 0·187–0·255 mm. broad. The vent sucker is situated at a distance of 0·119–0·321 mm. from the intestin fork. The prepharynx is absent. The globular pharynx measures 0·06 0·085×0·136–0·170 mm. The small oesophagus forks at a distance 0·119–0·321 mm. from the ventral sucker into two intestinal caeca whi terminate a little behind the posterior testis.



The two testes may be slightly or deeply notched on their anterior margins, and are placed obliquely in the inter-caecal region at 0·051–0·238 mm. wide apart. The anterior testis measures 0·374–0·527×0·493–0·748 mm. and the posterior testis 0·408–0·595×0·476–0·965 mm. The cirrus sac is large and more or less semilunar, curving round the ventral sucker. It measures 0·561–0·935 mm. in length and 0·153 mm. in its maximum breadth. It is situated to the right of the ventral sucker. The genital pore is just in front of the ventral sucker slightly to the left of the median line.

The ovary is almost spherical measuring 0·204–0·289 mm. long and 0·238–0·323 mm. broad, placed in front of the testes to the right of the median line. The oviduct arises from its left lateral aspect. The Mehlis' gland complex is situated to the left of the ovary. The uterine coils pass between the two testes filling the post-testicular region. The metraterm overlaps the ventral sucker and opens into the genital atrium. The uterine coils are filled with ova which are 0·030–0·032 mm. in length and 0·008–0·012 mm. in maximum breadth.

The vitelline glands are confined to the lateral sides of the body commencing either at the level of the intestinal fork or half-way between it and the ventral sucker to the middle or posterior margin of the posterior testis overlapping the intestinal caeca at some places.

RELATIONSHIPS

In having the oral sucker larger than the ventral sucker, *Astiotrema hoshiarpurium*, n.sp., resembles *A. impletum*, *A. reniferum*, *A. monticellii*, *A. emydis*, *A. elongatum*, *A. odhneri*, *A. fukuii* and *A. nathi*, and differs from *A. loossii*, *A. spinosa* and *A. orientale* in which oral sucker is smaller than ventral sucker and from *A. indica* and *A. dassia* in which both the suckers are of the same size.

-OVER-

The new species differs from *A. impletum* in the position of the genital pore which lies in front of intestinal bifurcation in the latter and from *A. monticelli* in which the ventral sucker is cephalad to the intestinal bifurcation. *A. hoshiarpurium* can be separated from *A. emydis* in which the testes and ovary are of equal size and the vitelline follicles confluent medially anterior to the ventral sucker and from *A. odhneri*, *A. fukuii* and *A. nathi* in the extent of intestinal caeca and of the vitellaria and in the shape of its testes. In the extent of intestinal caeca, the new species resembles *A. reniferum*, *A. elongatum* and *A. rami*, but it stands apart from them in the shape of testes and the extent of vitellaria.

Astiotrema impleta (Looss, 1899) Looss, 1900

(Рис. 108)

Синоним: *Astia impleta* Looss, 1899

Хозяин: рыба — *Tetrodon fahakara.*

Локализация: средняя часть кишечника.

Место обнаружения: река Нил, около Каира.

Описание вида (по Лооссу, 1899). Длина наибольших экземпляров достигает около 3 мм при ширине 1,0 мм. Передний и задний концы равномерно закруглены. Ротовая присоска лежит почти вентрально и имеет в диаметре 0,37 мм. Брюшная присоска, лежащая довольно далеко впереди, имеет в диаметре только 0,2 мм. Кутикула в передней части тела прорезана довольно густо чешуйками шириною в 0,006 мм, которые кзади уменьшаются и размером и количеством; начиная приблизительно от уровня семенников они становятся очень скудными. Фаринкс достигает 0,015 мм в диаметре; имеется короткий, тонкий пищевод, снаружи окруженный железистыми клетками, который непосредственно впереди брюшной присоски и позади полового отверстия бифурцирует, образуя кишечные стволы.

FROM ODHNER, 1910

* AFTER LOOSS FROM PRATT, 1902

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-OVER-

Astiotrema impletum (Looss, 1899) Looss, 1900
Synonym: Astia impleta Looss, 1899.
Host: Tetraodon fahaka (Tetraodontidae).
Habitat: Small intestine.
Locality: Giza Fish Market, Giza Province, Egypt.
Date: 8 August 1952.
Specimens deposited: USNM Helm. Coll., No. 59828 (two slides with one and two worms, respectively).

This parasite was originally described from *Tetraodon fahaka* collected from the Nile at Cairo by Looss (1899); the length of his largest specimen was 3 mm. Odhner (1911) and Yeh and Fotedar (1958) redescribed this species from the same host from the Nile in Sudan. Odhner's specimens were up to 2.5 mm long, and Yeh and Fotedar's between 1.8 to 3.5. The present collection consisted of 66 worms from one *T. fahaka*, only 17 of which were egg-bearing adults.

Description: Mean measurements (with minima and maxima in parentheses) of eight whole mount sexually mature adults: body, length 1,722 (1,105 to 2,530), width at anterior testis 588 (405 to 750); preoral lobe, length 38 (20 to 70); preacetabular body length 456 (360 to 630); postesticular body length 454 (185 to 795); oral sucker 250 (185 to 290) by 285 (225 to 360); acetabulum 163 (125 to 195) by 173 (130 to 215); ratio of lengths of suckers 1:0.59 to 0.70; pharynx 90 (65 to 105) by 123 (102 to 150); distance from cecal bifurcation to acetabulum overlapping (in 3) to 155; distance from genital pore to acetabulum 4 (1 to 7); anterior testis 260 (195 to 340) by 245 (135 to 335); distance from acetabulum to anterior testis 228 (130 to 470); posterior testis 273 (215 to 345) by 274 (160 to 340); distance from acetabulum to posterior testis 372 (205 to 610); cirrus sac 373 (240 to 605) by 131 (85 to 195); distance from acetabulum to posterior end of cirrus sac 182 (60 to 315); ovary 160 (120 to 180) by 163 (130 to 185); distance from acetabulum to ovary, overlapping (in seven) to 75; seminal receptacle (in five) 130 (82 to 210) by 212 (145 to 305); 20 older intrauterine eggs 41 (36 to 45) by 18 (15 to 19).

Discussion: Several differences exist between the specimens of this study and those described by Looss (1899), Odhner (1911), and Yeh and Fotedar (1958). First of all, Looss stated that the genital pore was located somewhat anterior to the acetabulum and anterior to the cecal bifurcation; whereas, in all but one of our sexually mature specimens it was either bifurcal or postbifurcal and exceedingly close to the anterior margin of the acetabulum; the cirrus and metraterm, both thick-walled, extended anterior to the genital pore in our specimens before turning posteriorly to enter the shallow genital atrium. Odhner (1911) also noted the position of the genital pore at the anterior border of the acetabulum, but slightly submedian to the left. Yeh and Fotedar (1958) stated that the genital pore opened in the area of the cecal bifurcation, their figure showed the pore just at the end of the esophagus at its bifurcation. Secondly, Looss (1899) illustrated in his figure and inferred in his text that the testes were well separated from one another, permitting the excretory bladder and descending and ascending limbs of the uterus to pass between them. Yeh and Fotedar (1958) indicated likewise regarding the uterus. In our mature specimens the testes, with two exceptions, were in contact. The exceptions had the testes much closer together than illustrated by Looss. However, the limbs of the uterus do pass in a position ventral to the area of contact between the testes. Odhner (1911) noted that the testes were closer together with the uterus passing in a ventral position between them. Thirdly, the eggs in our specimens were operculate whereas no mention was made of this by Looss (1899), Odhner (1911), or Yeh and Fotedar (1958). Fourthly, our specimens showed a subcuticular layer of prominent cells, except in the preoral lobe, whereas neither Looss, Odhner, nor Yeh and Fotedar mentioned this. Finally, Odhner (1911) noted that the testes occasionally were slightly lobed and almost symmetrical; whereas, Looss (1899), Yeh and Fotedar (1958), and the present authors noted smooth testes at all times and a more diagonal position.

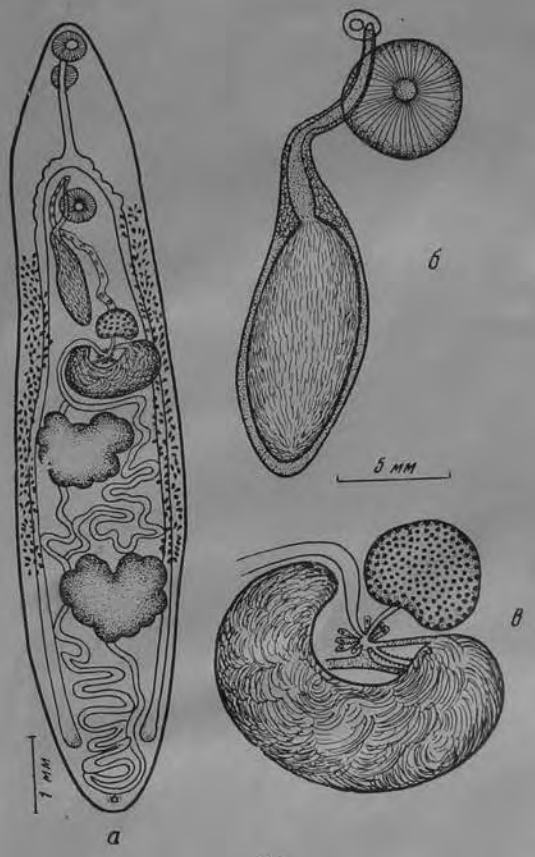
The measurement of the pharynx by Looss (1899) was listed as 0.015 mm. Without doubt, this is a typographical error as his illustration shows a much larger pharynx, one which was slightly smaller than the acetabulum (diameter 0.2 mm). The correct figure probably is 0.150 mm.

Yeh and Fotedar (1958) reviewed the genus *Astiotrema* Looss, 1900, declaring the genus *Gauhatina* S. P. Gupta, 1955, a synonym. The only species of the latter, *G. batrachii*, was declared a synonym of *A. reniferum* (Looss, 1898) Looss, 1900. They transferred *A. emydis* Ejsmont, 1930, to the genus *Leptophallus* Lühe, 1909. Only four of the remaining 20 species of *Astiotrema* were regarded as valid, namely, *A. impletum*, *A. reniferum*, *A. montiicellii* Stossich, 1904, and *A. odhneri* Bhalerao, 1936. All the other species were regarded as synonyms of either *A. reniferum* or *A. odhneri*. Khalil (1959) regarded *A. odhneri* as a synonym of *A. reniferum*. He stated that in a personal communication Yeh agreed with this synonymy. He recognized five valid species, namely, *A. impletum*, *A. reniferum*, *A. montiicellii*, *A. geomydia* Siddiqui, 1958, and *A. sudanensis* which he described in his paper. Tiwari (1958) described *A. gigantiwum*, *A. obiorchis*, and *A. nehrai* from freshwater tortoises. Grabda (1959a) described *A. trituri* from *Triturus vulgaris*, the first record of *Astiotrema* from an amphibian, and (1959b) elucidated its life cycle. Shevchenko and Vergun (1960) presented the life cycle of *A. monticellii*. The validity of the species described by Tiwari and by Grabda was not considered by us. Grabda-Kazubska (1961) questioned the transfer of *A. emydis* to *Leptophallus* by Yeh and Fotedar (1958), and returned it to *Astiotrema*.

FROM FISCHTHAL AND KUNTZ, 1963

Astiotrema indica Thapar, 1933

Host : Chitra indica



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109. *Astiotrema indica* Thapar, 1933 (по Тапару, 1933)
а — марита; *б* — половая бурса; *в* — комплекс женских половых органов

Astiotrema lissemydis ~~n. sp.~~ Agrawal, 1964
(Fig. 11)

Thirteen specimens of this form were collected from the intestine of a turtle, *Lissemys punctata punctata* (Bonnaterre) at Lucknow.

DESCRIPTION: Body elongated, with rounded extremities, 1.82 to 2.95 × 0.49 to 0.54 mm in size. Its is covered with small backwardly directed spines. Oral sucker large and subterminal measuring, 0.19 to 0.22 × 0.19 to 0.21 mm. Prepharynx present; pharynx globular, 0.09 to 0.13 mm in diameter; esophagus very short immediately dividing into two simple intestinal ceca extending almost to posterior end of body. Numerous glands occur at base of pharynx and open into esophagus. Ventral sucker oval, smaller than oral sucker, 0.09 to 0.15 × 0.09 to 0.16 mm in size and lying between cirrus pouch and anterior testis at 0.57 to 0.98 mm i. e., nearly one third of body length from anterior extremity.

Genital pore median or submedian, lying between ventral sucker and intestinal bifurcation at 0.42 to 0.79 mm from anterior extremity. Excretory pore lies at hind end of body. Excretory bladder Y-shaped. The main stem extends up to testes, then divides into right and left branches.

Testes entire, rounded or oval, postovarian, situated diagonally one behind other in second quarter of body. Anterior testis smaller than posterior, 0.17 to 0.30 × 0.16 to 0.35 mm in size at 0.75 to 1.4 mm from anterior extremity. Posterior testis, 0.20 to 0.33 × 0.30 to 0.38 mm in size at 0.56 to 0.86 mm from hind end of body. Cirrus pouch claviform, elongated, dorsal to acetabulum, 0.25 to 0.50 × 0.10 to 0.16 mm in size, extending far beyond ventral sucker as far as ovary. Vesícula seminalis large, occupying a greater portion of ventral sucker, 0.18 to 0.25 × 0.05 to 0.08 mm in size; pars prostatica oval, 0.04 to 0.05 × 0.03 to 0.05 mm in size; ejaculatory duct long, narrow, 0.07 to 0.15 mm in length, opening at genital pore.

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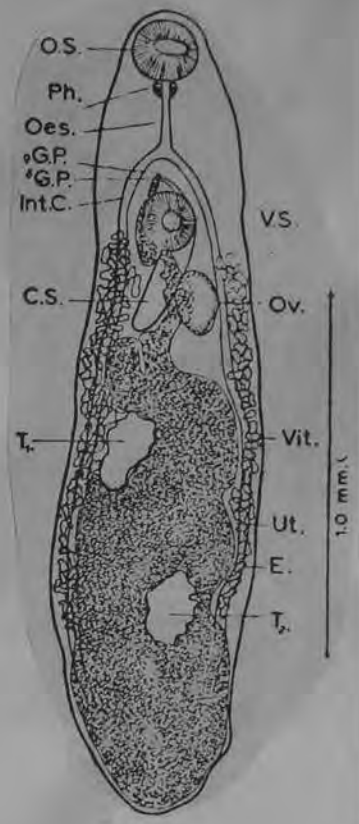
Ovary oval, entire, preequatorial, close to acetabulum, 0.15 to 0.20 × 0.16 to 0.23 mm in size and lies at 0.56 to 1.1 mm from anterior extremity. From hind end of ovary arises oviduct which opens at oötype. Receptaculum seminis pear shaped and elongated transversely, 0.11 to 0.12 × 0.04 to 0.05 mm in size. Vitellaria small, follicular, extending from genital pore to a little posterior to hind end of posterior testis where they are confluent medially. They are mainly lateral in position but cover intestinal ceca and at places extend into intercecal space. Uterus arises from left side of oötype and runs posteriorly in a sinuous course towards posterior end and then passes anteriorly to left of cirrus sac and opens at genital pore. Eggs oval and non operculate, 0.025 to 0.041 × 0.0125 to 0.024 mm in size.

HOST: *Lissemys punctata punctata* (Bonnaterre).
LOCATION: Intestine.
LOCALITY: Lucknow.

DISCUSSION: The new form differs from all the known species of the genus *Astiotrema* with the exception of *A. emydis* and *A. cyclemydis* in having a very short oesophagus. The new form differs from *A. emydis* in the extension of vitellaria much below the bifurcation of ceca and in not being confluent medially anterior to ventral sucker, in the extension of ceca up to hind end of body and in having ovary smaller than testes. From *A. cyclemydis* it is distinctive in the nature of vitellaria which are confluent medially behind posterior testis, in the extent of uterine coils, in having a preequatorial ovary and in the possession of numerous glands at the base of pharynx. Accordingly it is regarded as a new species with the specific name *A. lissemydis* n. sp.

ASTIOTREMA LISSEMYSI sp. nov. Qazi and Qazi,



Body somewhat elongated, rounded at both ends. Posterior extremity broader, anterior somewhat tapering. Length : 1.99-2.23. Maximum breadth : 0.50-0.56. Cuticle beset with closely packed, backwardly directed spines. The spines are, however, widely spaced beyond the intestinal caeca Oral sucker : 0.18 x 0.16, subterminal, larger than ventral sucker. Ventral sucker pre-equatorial, 0.15 x 0.16., behind the intestinal bifurcation. Distance between two suckers 0.48. Mouth situated subterminally and surrounded by oral sucker. Prepharynx absent. Pharynx : 0.02 – 0.05, oesophagus : 0.19, of moderate length. Intestinal bifurcation in front of genital aperture at a distance of 0.087 from the ventral sucker. Caeca long, passing along the side of the body and extending beyond the testes. Blind end of caeca about 0.27 from the posterior end. Vitelline follicles mainly extra caecal. Some follicles, however, project into the intercaecal field. On the right side, they are slightly more extensive, extending from about the middle of ventral sucker to the level of the hind border of posterior testis. On the left side, the follicles extend from the level of posterior border of ventral sucker to the middle of hind testis.

Male genital complex consists of testes lying obliquely, 0.28 apart. Each testis is irregularly lobed having its long axis along the antero-posterior axis of the worm. Anterior testis 0.131x0.21, of the same size as ovary. In all the specimens, the testes have same shape and position. The male genital pore is situated in between the ventral sucker and intestinal bifurcation at a distance of 0.05 from the ventral sucker. The uterus and cirrus sac appear to open separately. The latter is an elongated club shaped structure. It measures 0.48 in length. The side of the sac touches the ovary and its posterior end is in level with the posterior border of the ovary. The sac lies somewhat obliquely and passes along the dorsal side of the ventral sucker. The pars prostatica and cirrus are reduced.

The female genital complex comprises the ovary, 0.125 x 0.170, situated at a distance of 0.26 from the anterior testis and 0.06 from the ventral sucker. It lies on the left side of the body. The presence of laurel's canal could not be ascertained. The space behind the ovary is densely occupied by uterine coils, filled with ova. Each ovum is eloptical, dark brown, operculated and measures 0.031.

Bhalerao (1936) and Gupta (1954) divided the members of the genus Astiotrema into three groups viz : (i) Oral sucker larger than ventral sucker, (ii) Oral sucker smaller than ventral sucker, and (iii) Oral and ventral suckers of equal size. In having oral sucker larger than ventral sucker, ***Astiotrema lissemysi*** sp nov. resembles *A. monticelli* Stossich, (1904) ; *A. implentum* (Looss, 1899), Looss, (1900) ; *A Odhneri* (Odhner, 1911,) Bhalerao, (1936,) *A. fukii* Ogata, (1938) ; *A. nathi* Gupta, (1954) ; *A. mathaii* Gupta, (1954) ; *A. emydis*, Esjamont, (1930) ; *A. elongatum* Mehra, (1941) ; *A. hoshiarpurium* Gupta, (1954); *A rami* Bhalerao, (1936), and *A reniferum* (Looss, 1898 , Looss, 1900. It differs from *A. monticelli* in the position of ventral sucker, from *A. implentum* in the position of genital pore, from *A. odhneri*, *A fukii*, *A. nathi* and *A. mathaii* in having longer caeca which terminate behind the posterior testis and from *A. elongatum* and *A. hoshiarpurium* in the extent of vitellaria and shape, size and position of testis. In *A. rami* the testes are described as spherical and the uterus and cirrus sac pass on opposite sides of the ventral sucker, while in *A. reniferum* the testes are broader than long. In the present species, however, the testes are irregularly lobed and longer than broad. It, therefore, differs both from *A. rami* and *A. implentum*. Further, in *A. elongatum*, *A. hoshiarpurium*, *A. rami* and *A. reniferum*, the testes are distinctly larger than the ovary. But in *Astiotrema lissemysi* the testes are almost of the same size as the ovary. In this respect it resembles *A. emydis*. It can be

distinguished from the latter among other things, by the extent of vitellaria which are not confluent medially in front of the ventral sucker, by a moderately long oesophagus, by the shape, size and position of the cirrus sac and by the shape of testes which are placed wider apart. In view of the many differences from all the known species of the genus Astiotrema, we consider it necessary to regard it a new species for which the name *Astiotrema lissemysi* is proposed.

Host-*Lissemys puncta granosa*

Location—Intestine

Locality—Thatta (Hyderabad division West Pakistan).

Type slide deposited with the Zoology museum

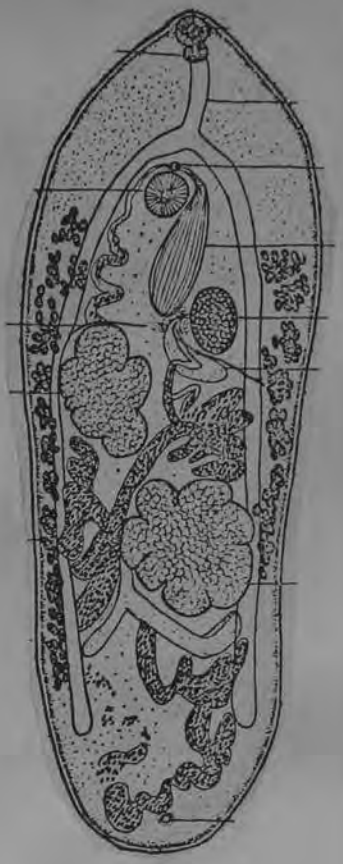
University of Karachi.

SUMMARY

Astiotrema lissemysi n. sp from the intestine of a fresh water turtle *Lissemys punctata granosa* is described. The present species has been distinguished from all the known species of the genus, by the extent of viteliaria, the size of oral and ventral suckers, the shape and size of testis and the position of cirrus sac.

Astiotrema lobiorchis ~~n.sp~~ Tiwari, 1958

Plagiorchiidae



The description of *Astiotrema lobiorchis*, n. sp. is based on a single specimen obtained from the intestine of *Kachuga dhongoka* from a local tank. The worm is dorsoventrally flattened with rounded anterior and posterior ends. It measures 6·6 mm in length and 2·3 mm. in breadth in the region of the anterior testis. The body is beset with numerous small spines in the anterior region.

The subterminal oral sucker measures 0·22 × 0·25 mm. The ventral sucker is larger than the oral sucker and measures 0 35 mm. in diameter and is situated at a distance of 1·26 mm. from the anterior end. The pharynx measures 0·13 × 0·16mm. It is preceded by a small prepharynx measuring 0·06 × 0·11 mm. The oesophagus is 0·56 mm. in length and 0·21 mm. in breadth. The intestinal bifurcation lies at a distance of 0·98 mm. from the anterior end. The intestinal caeca run along the sides of the body and terminate about half way between the posterior margin of the posterior testis and the hinder end of the worm.

The excretory pore is situated at a distance of 0·22 mm. from the posterior end and leads into a Y shaped bladder.

The two testes are diagonally placed in the middle third of the body. The anterior testis which touches the left intestinal caecum measures 1·05 × 0·85 mm. and is 2·6 mm. away from the anterior end. The posterior testis 1·12 × 1·05 mm. in size touches the right intestinal caecum and is placed at a distance of 0·12 mm. from the anterior testis. Both the testes are lobulated having 6-7 lobes with a posterolateral lobe smaller than others.

The cirrus sac is large, oval, bag like extending behind the ventral, sucker upto the middle level of the ovary. It is broad in its basal part and narrow in its terminal part and measures 1·13 mm. in length and 0·36 mm. in breadth. It encloses the vesicula seminalis which fills up its greater part, a tubular parsprostatica surrounded by large number of prostate glands and a cirrus. The genital pore is just above the ventral sucker in the median line.

The ovary is placed close to the right intestinal caecum 2·2 mm. from the anterior end. It is oval in shape and measures 0·56 × 0·39 mm. From its median lateral aspect on the right side arises the oviduct which after a short course receives the duct of receptaculum seminis. The receptaculum seminis is a large sac transversely disposed measuring 0·84 × 0·17 mm. The ootype is on the right side of the ovary in the median line at the base of the cirrus sac.

The vitellaria are mostly extracaecal in position and extend anteriorly upto the posterior level of the ventral sucker. posteriorly they terminate a little infront of the intestinal caecum on the left side while on the right they extend to about 3/4th level of the posterior testis.

The uterus arises from the posterior side of the ootype. Its coils extend upto the posterior end of the body. The terminal part of the ascending limb extends close to the left intestinal caecum and opens into the genital atrium.

The uterine eggs are oval in shape and measure 0·03 × 0·012 mm.

ASTIOTREMA LONGICIRRA ~~SP. NOV~~ DWIVEDI, 1966
(Figs. 5-6)

Body elliptical (Fig. 5) and measures 1.605-3.01×0.750-0.645 mm.; maximum diameter uniform from intestinal bifurcation to posterior level of posterior testis. Cuticle thin spinous; spines more aggregated in anterior region specially round the oral sucker, below the level of ventral sucker spines gradually disappear; anterior end blunt, posterior end semicircular bearing a subterminal excretory opening.

Oral sucker subterminal, round and measures 0.225-0.285×0.210-0.255 mm., larger than ventral sucker. Ventral sucker situated at one third of body length from anterior end and measures 0.150-0.240×0.150-0.225 mm. suckers ratio 1.2:1. Prepharynx very small inconspicuous; pharynx globular and measures 0.105-0.150×0.090-0.120 mm.; oesophagus of moderate size and measures 0.12-0.14 mm.; intestinal bifurcation 0.435-0.465 mm. from anterior level of ventral sucker; intestinal caeca quite long, of equal length and reach half way in between posterior margin of posterior testis and posterior end of worm. Testes oblique, lobed, situated in lower half of body; anterior testis approaches equator, transversely elongated, touches left intestinal caecum and measures 0.255-0.345×0.18-0.270 mm.; posterior testis similar in shape to anterior testis, touches right intestinal caecum and measures 0.315-0.405×0.225-0.360 mm.; intertesticular zone measures 0.17-0.195 mm. cirrus sac well developed, extends posteriorly beyond posterior level of ovary upto shell gland complex and measures 0.450-0.645 mm. in length, with maximum diameter of 0.181 mm. in basal region of vesicula seminalis; vesicula seminalis long saccular with a small duct; pars prostatica bulb-like; innumerable prostate gland cells; protrusible cirrus present.

Ovary ovate, submedian towards right side, measures 0.135-0.210×0.090-0.210 mm., situated in between right intestinal caecum and cirrus sac; Laurer's canal present; receptaculum seminis sac-like, large, transversely disposed, situated at equator of body, extending laterally upto right intestinal caecum; uterus much convoluted of typical plagiorchiid type, with both ascending and descending limbs passing through intertesticular zone; metraterm absent; genital opening situated in level with anterior margin of ventral sucker; terminal part of uterus and cirrus sac lie on the same side of ventral sucker; eggs innumerable and measure 0.0460-0.048×0.016-0.018 mm.; vitellaria extend from posterior level of ventral sucker to middle of posterior testis; both vitelline glands of equal extent and overlap intestinal caecum of their zone.

Excretory system (Fig. 6) Y-shaped excretory bladder with subterminal excretory opening, median stem not straight but spreads in a zigzag manner between two testes, measures 1.29-1.37 mm. and extends upto shell gland complex where it bifurcates into two short cornua extending upto level of posterior margin of ventral sucker; excretory system very closely resembles that of *A. dassia* Dayal, 1938 but for subterminal excretory opening.

Host : *Kachuga intermedia*.
Location : Intestine.
Locality : Pariat tank, Jabalpur, M. P., India.

Fig 5

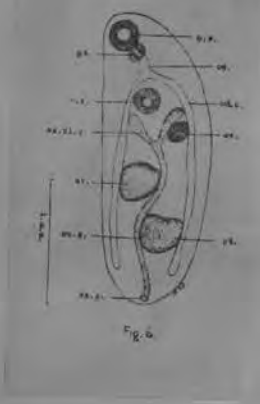


Fig. 6

5. Dorsal view showing internal anatomy.

6. (Dorsal view) showing excretory system.

-OVER-

DISCUSSION

A. longicirra sp. nov. differs from *A. loossii* (Syn. *A. gangeticus* Harshey, 1932, *A. lobiarchis*) *A. spinosa* and *A. orientale* (Syn. *A. amydea* Ogata, 1938 *A. foochowensis* Tang, 1941) in having different dimensions of the suckers. In all these species oral sucker is smaller than ventral sucker. Further the new species show differences from *A. dassia*, *A. indica*, *A. thapari* and *A. mehrai* in having unequal size of the suckers because in all these species suckers are of equal size. *A. longicirra* sp. nov., in having the oral sucker larger than ventral sucker, resembles *A. monticelli*; *A. impletum*, *A. odhneri*, *A. fukuii*, *A. nathi*, *A. matthaii*, *A. emydis*, *A. elongatum*, *A. hoshiarpurium*, *A. rami* and *A. reniferum*. *A. longicirra* sp. nov. shows specific differences from all these species in which oral sucker is larger than ventral sucker. It differs from *A. monticelli* in having ventral sucker behind the intestinal bifurcation, from *A. impletum* in having genital pore below the intestinal bifurcation, from *A. odhneri* in the intestinal extent, from *A. fukuii* in having oblique testes and the intestinal extent, from *A. nathi* in shape, size of the body and extent of intestinal caeca and vitellaria, from *A. matthaii* in body size, long oesophagus, intestinal extent and vitellaria, from *A. emydis* in having vitelline follides not confluent and testes larger than the ovary and from *A. elongatum*, *A. reniferum* and *A. hoshiarpurium* in having noncephalad condition of vitellaria. Finally it resembles *A. rami* but differs strikingly in having spination in preacetabular zone; genital opening in the level with the anterior margin of the ventral sucker, extension of the cirrus sac beyond the ovary, uniform extension of the two vitelline glands, absence of metraterm and the excretory system.

In view of the above characters, the present form, deserves the status of a new species, for which the name *A. longicirra* is proposed.

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GENUS *ASTIOTREMA* LOOSS, 1900

The genus *Astiotrema* has been recorded from fishes and reptilian hosts only. In 1954, Gupta regarded *A. foochowensis* Tang, 1941 synonymous to *A. orientale* Yamaguti, 1937. The species recorded from fish hosts are *A. dassia* Dayal, 1938; *A. impletum* Looss, 1899 and *A. spinosa* Chatterji. 1933 The rest belong to the reptiles viz. *A. monticelli* Stossich, 1904; *A. odhneri* Odhner, 1911 Bhalerao, 1936; *A. fukuii* Ogata, 1938 *A. nathi* Gupta, 1954; *A. matthaii* Gupta 1954; *A. emydis* Ejsmont, 1930; *A. elongatum* Mehra, 1931; *A. hoshiarpurium* Gupta, 1954; *A. rami* Bhalerao, 1936; *A. reniferum* Looss, 1898, Looss, 1900; *A. Loossii* Mehra, 1931, (Syn. *A. Gangeticus* Harshey, 1932) *A. orientale* Yamaguti, 1937 (Syn. *A. amydae* Ogata, 1938 and *A. foochowensis* Tang 1941); *A. srivastavai* Gupta 1954; *A. indica* Thapar, 1933; and *A. thapari* Gupta, 1954; *A. giganticum* Tiwari, 1958; *A. lobiorchis* Tiwari, 1958 and *A. mehrai* Tiwari, 1958.

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ASTIOTREMA LOOSSII MEHRA, 1931

ADULT

Body elongated (Fig. 2) elliptical measures 5.89×1.56 mm. with maximum diameter uniformly spreading from the region of intestinal bifurcation upto their termination; thin cuticle with backwardly directed spines measuring .0075 mm., restricted only in the region of oral sucker. Anterior end triangular and posterior end semicircular bearing subterminal excretory pore.

Oral sucker subterminal rounded, measuring 0.23 mm.; preoral region measuring 0.063 mm. in length. Ventral sucker rounded a little larger than oral sucker, situated at one fifth of the body length from the anterior end of the body, measuring 0.29 mm. Ratio of oral sucker to ventral sucker 1:1.3.

Prepharynx present very small. Pharynx globular measuring 0.15 mm.; oesophagus long, of moderate size, measuring 0.42×0.042 mm. Intestinal bifurcation measuring 0.87 mm. from the anterior end and 0.154 from the ventral sucker. Intestinal caecum of equal size.

Testes oblique in the middle of the body, equally lobed, (3 lobes in each testes). Anterior testes above the equatorial line, measures 0.57× 0.72 mm. Posterior testis situated just below the equatorial line in between the median line and right intestinal caecum, little larger than anterior testis and measures 0.72×0.75 mm. and 1.708 mm. distance in between its posterior margin and posterior end of the body. Inter testicular zone measures 0.28 mm. Cirrus sac well developed with oblique axis and measures 0.71 mm. in length, enclosing a large voluminous vesicula seminalis in the saccular basal region which measures 0.28 mm. in breadth, reaching back to the middle of the ovary, terminal part tubular curved and situated on the dorsal right side of the ventral sucker. The pars prostatica, prostatic glands and ductus ejaculatorious small.

Ovary (Fig. 4) ovate with entire margin situated on the right side measuring 0.392×0.26 mm. in length and breadth and 0.28 mm. from the posterior margin of the ventral sucker. Receptaculum seminis sac like with a diameter 0.084 mm. Laurer's canal fairly big leaving a distance of 1/8th of the ovary in a dorso-ventrally flattened specimen. Uterus much convoluted, of a plagiorchiid type, voluminous, full of eggs with both ascending and descending limbs and pass in between the two testes. Metraterm strong, powerfully built, full of eggs, opening in a genital atrium situated on the median line of the anterior margin of the ventral sucker in a flattened specimen. Eggs more elongated than oval measuring 0.030×0.009 mm.; vitellaria partly over-lapping the intestinal caecum, commencing from the posterior margin of the ventral sucker extending upto middle of the posterior margin of the posterior testis and the ends of the intestinal caeca.

Host : *Kachuga intermedia* Boulenger.

Location : Intestine.

Locality : Pariat tank Jabalpur, M. P., India.

About two dozen tortoises, *Kachuga intermedia* were collected from Pariat tank at Jabalpur in the month of December 1963. These were found infected with *Astiotrema loossii* Mehra, 1931.

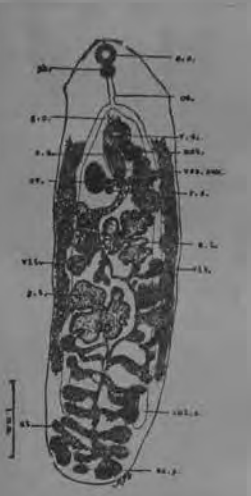

Fig 2

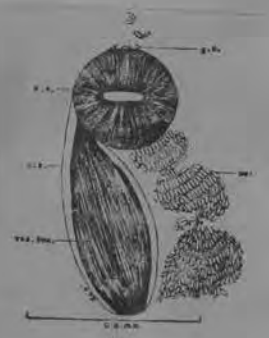

Fig 3

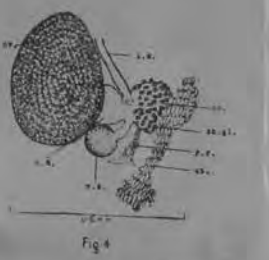

Fig 4

- OVER -

JUVENILE SPECIMEN

Body elongated, elliptical, anteriorly triangular, posteriorly semi-circular and measures 2.43×0.75 mm., with uniform diameter from ventral sucker to posterior testis. Posterior end of body bears sub-terminal excretory pore. Oral sucker subterminal, round and measures 0.150×0.120 mm. Ventral sucker round, little larger than oral sucker, measures 0.195×0.195 mm. Suckers ratio 1:1.3.

Prepharynx small inconspicuous. Pharynx globular (Mehra reported pear-shaped pharynx) and measures 0.075×0.060 mm. Oesophagus moderately long and measures 0.225 mm. Intestinal bifurcation measures 0.420 mm. distant from anterior end and 0.15 mm. from ventral sucker. Intestinal caeca long of equal length (Mehra reported unequal intestinal caeca) and extends up to the posterior testis.

Testes lobed (equal number of three lobes) oblique (Mehra reported anterior testis much lobed). Anterior testis touches left intestinal caecum and equator and measures 0.301×0.240 mm. Posterior testis touches right intestinal caecum, little larger than anterior testis and measures 0.390×0.255 mm. Inter testicular zone measures 0.045 mm. Cirrus sac elongated, tubular, extends up to anterior level of ovary and measures 0.360 mm.

Ovary ovate with entire margin, situated on right side and measures 0.180×0.120 mm. (Mehra reported kidney shaped ovary with notched margin). Receptaculum seminis present. Shell gland complex, Laurer's canal, uterine coils and eggs not seen. Genital opening situated in between intestinal bifurcation and anterior margin of ventral sucker, little more towards the later. Vitelline follicles in bunches and commence from ventral sucker upto a little behind posterior testis.

Excretory system - Y-shaped excretory bladder, subterminal excretory opening.

The present Juvenile form of *A. loossii* is smaller than that described by Mehra, 1931. It has some differences, eggs, uterine coils, shell gland complex are not visible; lobulation is not deep, the pharynx is not pear-shaped; ovary is not kidney-shaped and notched; the anterior extent of vitelline follicles is little different; otherwise it shows resemblance in shape of body, suckers ratio and general proportion of internal organs like oesophagus, intestinal caeca, testes, excretory bladder etc. In comparison to adult form which author obtained from the intestine of *Kachuga intermedia*, the position of ventral sucker and testis is slightly posterior in the body. When these grow in intestine of *Kachuga intermedia* the post testicular region of body elongates and position of ventral sucker and testes is relatively changed with respect to body. Further cirrus sac becomes more prominent with swollen vesicula seminalis owing to full development; testes become matured so the three lobes become indented; vitelline follicles grow fully and lose their bunch-shape and assume intermingling look; shell gland complex becomes apparent and ultimately uterus makes its appearance in a typical plagiorchiid fashion i. e. the two ascending and descending limbs pass in between the two testes with thick uterine coils in post testicular region, full of eggs.

Mehra (1931) described this species on the basis of a single juvenile form obtained from the small intestine of *Kachuga dhongoka*. Later on Bhalerao, 1936 redescribed this species on the basis of a single adult obtained from the intestine of *Lissemys punctata*. The present observations show striking differences from the account of Bhalerao.

Fig. 1.

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– CONTINUED –

Astiotrema loossi Mehra, 1931 -- continued

REMARKS

Bhalerao (1936) described the adult of *A. loossii* Mehra (1931) from the intestine of *Lissemys punctata*. Author collected the adult of *A. loossii* from the intestine of *Kachuga intermedia*. In *A. loossii* described by Bhalerao (1936) the body measurements are 2.76×1.625 mm.; shape is elliptical; cuticle is not spiny ventral sucker is situated 2/7th of the body length from the anterior end vesicula seminalis is bilobed; ovary is an irregular body and the distribution of vitelline glands on both sides is not symmetrical. In the adult form of *A. loossii*, collected by author, the body measurements are 5.89×1.56 mm.; (length almost double) shape is slender elongated and attenuated; cuticle has crown of spines in the region of oral sucker; ventral sucker is situated 1/5th of the body length from the anterior end; vesicula seminalis is not bilobed but a single simple structure; ovary is a spherical body and there is symmetrical distribution of vitelline glands on both the sides. The author is of opinion that these differences are intra-specific variations which could be accounted for the change of host. Otherwise in rest of the characters like sucker ratio, shape of pharynx, extent of intestinal caecum, "Y" shaped excretory bladder with subterminal excretory opening, shape of testes and in the proportion of internal organs both the adults show striking resemblances.

SYNONYMITY OF SPECIES

Bhalerao (1936) synonymised *A. gangeticus* Harshey (1932) with *A. loossii* Mehra (1931). Gupta (1954) synonymised *A. amydae* Ogata (1938) and *A foochowensis* Tang (1941) with *A. orientale* Yamaguti (1937). Tiwari (1958) described *A. lobiorchis* from the intestine of *Kachuga dhongoka*. *A. lobiorchis* is very similar to *A. loossii* except in the size of the body; extension of vitellaria; shape of ovary; testes and size of receptaculum seminis. The original description of *A. loossii* pertains to a sexually immature form hence the size can not be relied upon. Author has obtained the adults of *A. loossii* (Fig. 2) which is nearly as big as *A. lobiorchis*. In *A. lobiorchis* the right vitelline glands extend posteriorly upto the 3/4th of the posterior testis while in *A. loossii* it extends beyond the posterior testis. The left vitelline glands comparison of the adult forms collected by Bhalerao (1936) and by author, appear to show intra specific variations; more over the condition present in *A. lobiorchis* is due to dwindling of some vitelline follicles of the posterior end; hence this character can not be relied upon. So far as the oval shape of ovary is concerned, Bhalerao (1936) has already synonymised *A. gangeticus* with *A. loossii* calling the shape of ovary as intra-specific variation. In author's openion shape of testes in *A. lobiorchis* and *A. loossii* is very similar except for the minor difference in lobulation; obviously that should not create a new species. The size of receptaculum seminis according to the present author is an age dependent factor. In view of the above discussion author concludes that *A. lobiorchis* Tiwari (1958) and *A. loossii* Mehra (1931) are synonymous forms.

In view of the synonymity of *A. gangeticus* and *A. lobiorchis* with *A. loossii*, the specific diagnosis of *A. lossii* needs amendment thus :

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Emended diagnosis of *Astiotrema loossii* Mehra, 1931 :—

Plagiorchiidae; Plagiorchinae. Elongated or elliptical measuring 2.76-6.6×1.56-2.3 mm. Body wall : spinous, spines not prominent in sexually immature form. Oral suckers terminal or slightly subterminal; ventral sucker larger than oral sucker situated below the intestinal bifurcation; suckers ratio 3:4. Prepharynx small, inconspicuous; pharynx well developed globular or pear-shaped; oesophagus of moderate size; intestinal caeca reaching far back in the posterior end upto mid-level in between the posterior margin of the posterior testis and the terminal end of the worm; intestinal caeca equal or slightly unequal. Testes lobed, oblique, intracaecal, anterior testis pre-equatorial in the sexually immature worm, touching the left intestinal caecum; cirrus sac elongated claviform, the posterior end stretching upto the middle of the ovary and anterior end tubular. Ovary round, spherical, ovate, kidney-shaped, margin smooth or lobed; receptaculum seminis present large or small; Laurer's canal present : uterine coils plagiorchiid type, with ascending and descending limbs passing in between the two testes; vitellaria arranged in groups or of mixed nature, extending anteriorly from the ventral sucker and posteriorly beyond the posterior testis but never beyond the blind ends of intestinal caeca; right vitelline gland shows variations, posteriorly it may terminate in the mid level of the posterior testis or may reach upto the intestinal end; genital opening in between the intestinal bifurcation and the anterior level of the ventral sucker; eggs yellowish brown, operculated measuring 0.238-0.325×0.009-0.013 mm. Excretory system: Y-shaped excretory bladder, excretory opening subterminal.

Habitat : Intestine of *Kachuga dhongoka*, *Lissemys punctata* and *Kachuga intermedia*.

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Astiotrema loossi Mehra, 1931

(Рис. 110)

Синоним: *Astiotrema gangeticum* Harshe, 1932

Хозяева: черепахи — *Rachuga dhongoka* (по Мэра), *Lissemys punctata* (по Харше).

Локализация: тонкие кишки.

Место обнаружения: Индия.

Историческая справка. Мэра в 1931 году описал под именем *Astiotrema loossi* трематоду из кишечника черепахи *Rachuga dhongoka*, а в 1932 году Харше (Harshe) описал трематоду *Astiotrema gangeticum* из кишечника черепахи *Lissemys punctata*.

В 1936 году Балерао обнаружил тоже в кишечнике *Lissemys punctata* трематоду, которую он определил как *Astiotrema loossi* Mehra, 1931. Сравнивая с этим видом *Astiotrema gangeticum*, Балерао пришел к выводу об их идентичности и отнес *Astiotrema gangeticum* к синонимам *Astiotrema loossi*. Балерао отмечает, что у *A. gangeticum*, по Харше, на вентральной поверхности тела имеются шипики, крупный семяприемник, круглый яичник, а желточные фолликулы не собраны в группы.

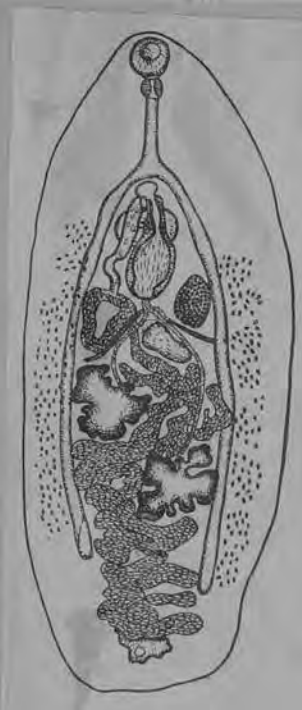
Изучая свой экземпляр *A. loossi*, Балерао констатировал, что у него яичник и семяприемник одинаковы с таковыми *A. gangeticum*, а желточники на одной стороне собраны в группы, а на другой — не собраны. Тем самым, Балерао считает, что характер желточников не может служить критерием вида у этого рода. Наличие же шипиков, по мнению Балерао, не должно служить основанием для обоснования нового вида.

Описание вида (по Мэра, 1931). Тело 2,7 мм длины и 1 мм максимальной ширины в области переднего семенника. Форма тела эллипсоидная. Задний конец более широкий, чем передний. Кутикула не имеет шипиков. Ротовая присоска расположена терминально, обращена на вентральную сторону, достигает 0,18 мм в диаметре. Брюшная присоска крупнее ротовой; она достигает 0,23 мм в диаметре. Присоска расположена на расстоянии 0,62 мм от переднего конца тела и 1,8 мм от заднего, занимая положение между первой и второй четвертью длины тела. Экскреторное отверстие лежит на вентральной поверхности тела, недалеко от заднего конца. Половые отверстия расположены медианно, впереди брюшной присоски.

Имеется небольшой префаринкс. Фаринкс грушевидной формы, 0,13 мм длины и 0,11 мм максимальной ширины. Пищевод длиною 0,18 мм при ширине 0,02 мм. Кишечная бифуркация находится на расстоянии 0,12 мм от брюшной присоски. Кишечные стволы заканчиваются на середине между задним концом тела и семенником; правый ствол немного длиннее левого.

Яичник лежит с правой стороны, достигая правого ствола кишечника на расстоянии 0,12 мм кзади от брюшной присоски; его передняя половина находится справа от половой бурсы. Он имеет форму почки; выпуклая наружная сторона разделена на доли; длина яичника 0,3 мм, а максимальная ширина 0,12 мм. Тельце Мелиса лежит кнутри от заднего края яичника. Семяприемник и лауреров канал очень маленькие. Семенники лежат наискось в задней половине тела. Передний семенник более лопастной, 0,33 мм в диаметре, расположен слевой стороны, достигает левого кишечного ствола, лежит позади яичника, на расстоянии 0,4 мм позади брюшной присоски. Задний семенник расположен с правой стороны, занимает пространство между продольной осью тела и правым кишечным стволом, на

а



FISCHTHAL AND KUNTZ, 1965

Astiotrema magniovum n. sp. (Figs. 6, 7)

HOST: *Dogania subplana* (Trionychidae)

HABITAT: Large intestine.

LOCALITY: Kasiqui, North Borneo.

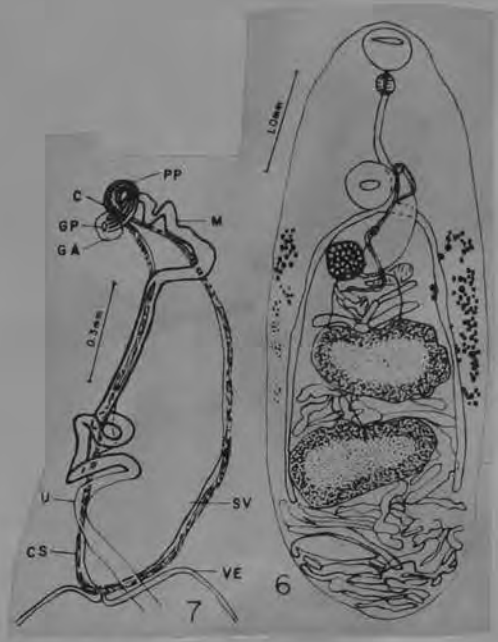
DATE: 29 August 1960.

HOLOTYPE: U.S.N.M. Helm. Coll. No. 60951.

DIAGNOSIS (based on a single specimen): Body 6,080 by 2,110, elongate, broad, entirely spined, latter heavier and more numerous anteriorly. Forebody 1,316, hind body 4,266, preoral body 43, posttesticular space 1,077. Oral sucker 422 by 483, subterminal, aperture a transverse slit at anterior third of sucker length; acetabulum 498 by 552, at anterior fourth of body length, aperture a transverse oval; sucker length ratio 1 : 1.18. Prepharynx 66 long, pharynx 199 by 173; esophagus 1,074 in longitudinal extent, bifurcating at posterior margin of acetabulum; ceca narrow, extending to level of posterior margin of posterior testis. Excretory pore just subterminal dorsal.

Testes two, slightly lobed, much wider than long, tandem but 123 apart, postequatorial, intercecal but may contact cecum, dorsal to uterus; anterior testis 845 by 1,380, 360 postacetabular; posterior testis 845 by 1,488, 1,344 postacetabular. Vasa efferentia entering cirrus sac side by side. Cirrus sac 1,192 in longitudinal extent by 372, extending from 652 postacetabular to 48 preacetabular, slightly overlapping sinistral part of ovary ventrally, ascending next to sinistral margin of acetabulum, saccular, with proximal loop, containing seminal vesicle, pars prostatica, prostate cells, and cirrus. Seminal vesicle 1,075 by 327, filling most of the cirrus sac. Pars prostatica cell lined, relatively thick walled in proximal loop of cirrus sac, surrounded by prostate cells. Cirrus short, muscular. Genital atrium shallow. Genital pore at anterosinistral margin of acetabulum.

Ovary 391 in diameter, smooth, submedian to right, intercecal, 276 postacetabular, 310 pretesticular. Ootype complex large, posteromedian to ovary and posterior to cirrus sac. Mehlis' gland well developed. Seminal receptacle 805 by 220, transversely elongate, extending from posterior to ovary along posterior and posterosinistral parts of cirrus sac. Laurer's canal muscular, winding, opening on dorsal surface between cirrus sac and anterior testis. Vitellaria follicular, in lateral fields at about mid-body length, mostly extracecal, commencing 2,021 from anterior extremity, 207 to 215 postacetabular and 61 to 69 preovarian, fields 1,588 to 1,718 long, terminating 2,333 from posterior extremity. Uterus winding, descending between testes to posterior extremity, filling posttesticular space. Metraterm muscular, winding, commencing just preovarian, crossing and overlapping cirrus sac ventrally, entering genital atrium sinistral to cirrus. Eggs numerous, operculate, relatively large, 20 measuring 62 to 76 by 28 to 35.



DISCUSSION: Yeh and Fotedar (1958) reviewed the genus, recognizing only four species: *A. reniferum* (Looss, 1898) Looss, 1900, *A. impletum* (Looss, 1898) Looss, 1900, *A. monticellii* Stossich, 1904, *A. odhneri* Bhalerao, 1936. Khalil (1959) declared *A. odhneri* a synonym of *A. reniferum*, recognizing the latter, *A. impletum*, *A. monticellii*, *A. geomydia* Siddiqui, 1958, and *A. sudanensis* which he described in his paper. Tiwari (1958) described three additional species, and Grabda (1959a) one. Ahluwalia (1961) declared *A. geomydia* a synonym of *A. impletum*. Our form differs from all the above species in the large size of its eggs, hence the specific name *magniovum*. In the key to the species given by Yeh and Fotedar (1958) our specimen keyed to *A. odhneri*. In the key given by Khalil (1959) it keyed to a choice between *A. monticellii* and *A. reniferum*, but did not entirely fit either one; it resembles the former in having the cecal bifurcation at the posterior margin of the acetabulum, and the latter in having the ceca extend more posteriorly and the vitellaria more dispersed (but not as much as for the latter species). Whether the extensive synonymy stated by Yeh and Fotedar and by Khalil, based solely on adult morphological characteristics, is entirely valid can not be ascertained until additional life histories are elucidated. Grabda (1959b) presented the life history of *A. trituri* and Shevchenko and Vergun (1960) that of *A. monticellii*.

N. K. GUPTA, 1954

Astiotrema matthaii ~~n.sp.~~ (Fig. 5.)

Host .. .. *Lissemys punctata punctata.*
Location .. Intestine.
Locality .. Hoshiarpur (India).

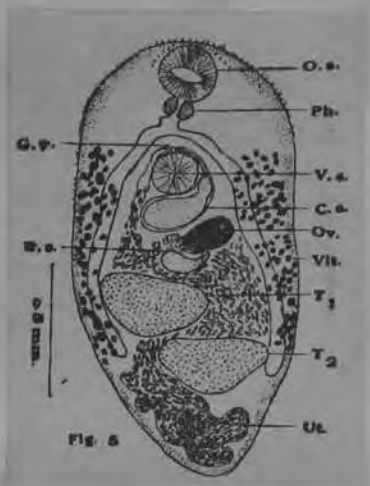


Fig. 5

The worm is elliptical with broader anterior end and narrower posterior . It measures 1·64 mm. in length and 0·84 mm. in maximum breadth, ich is across the intestinal fork. The body is covered with minute kwardly directed spines. In the anterior region of the body these nes are prominent and are arranged closely, whereas in the posterior on they are absent.

The mouth is subterminal in position, at the anterior end of the body. is surrounded by the oral sucker which measures 0·172 mm. in length 0·228 mm. in breadth. The mouth opens into the pharynx which is bular and measures 0·052×0·108 mm., there being no prepharynx. pharynx is followed by a small oesophagus which is 0·034 mm. long. intestinal bifurcation lies in front of the ventral sucker. The two stinal caeca run along the lateral sides of the body and terminate at the l of the posterior testis. The right intestinal caecum ends in level h the second half and the left in the first half of the posterior testis.

The male genitalia consist of two testes, which are entire in their lines and are placed obliquely in the inter-caecal region. Each testis lmost flat anteriorly and convex posteriorly. The anterior testis mea- s 0·224 mm. in length and 0·38 mm. in breadth and lies close to the intestinal caecum. The posterior testis measures 0·192×0·383 mm. lies close to the right intestinal caecum. The cirrus sac is an elongated ucture measuring 0·469 mm. in length and 0·112 mm. in maxmium breadth and is placed transversely behind the ventral sucker. It curves round its right side to open at the genital pore which lies in between the intestinal bifurcation and the ventral sucker. The vesicula seminalis fills the three-fourths of the cirrus sac. The pars prostatica is small.

The female genital organs consist of the ovary, which is transversely elongated and is placed right to the median line in front of the testes. It measures 0·119 mm. in length and 0·204 mm. in breadth. The Mehlis' gland complex lies to the left of the ovary. The receptaculum seminis is like a small bag placed mesially at the equatorial line in front of the anterior testis. It is 0·128 mm. in length and 0·240 mm. in breadth. The terminal portion of the uterus lies on the opposite side of the ventral sucker round which the cirrus sac passes. The vitelline follicles are scattered along the lateral sides of the body. They extend from the level of the ventral sucker to the middle of the posterior testis. The eggs are 0·020–0·030×0·008 mm. in size. The species has been named after the late Dr. George Matthai, my old Professor at Government College, Lahore.

Relationships

In having a larger oral sucker as compared to the ventral sucker, the new species described above is different from those species in which the oral sucker is either equal to or smaller than the ventral sucker. Amongst the species with the oral sucker larger than the ventral sucker, the new species resembles *A. odhneri*, *A. fukuii* and *A. nathi* in the extent of the intestinal caeca, the position of the genital pore and of the ventral sucker. But it differs from them in having testes of different shape, the transversely elongated ovary and the cirrus sac placed transversely behind the ventral sucker. It differs from *A. fukuii* in the position of the testes and from *A. nathi* in having a smaller oesophagus and in the extent of the vitellaria

ASTIOTREMA MEHRAI, n. sp.

& Tiwari, 1958

A large number of specimens of this species were obtained from the intestine of *Kachuga dhongoka*. The worms are elongated with rounded anterior and posterior ends. They measure 5·7-6·9 mm. in length and 1·19-1·49 mm. in breadth at the level of the anterior testis. The body is beset with sharp pointed spines which are more crowded towards the anterior end.

The oral sucker measures 0·19-0·21 mm. × 0·19-0·21 mm. and is approximately equal to the ventral sucker. The ventral sucker 0·19-0·22 × 0·19-0·22 mm. in size is placed at a distance of 0·85-1·18 mm. from the anterior end. The prepharynx is very small. The pharynx measures 0·12-0·14 × 0·105-0·11 mm. The oesophagus is 0·28-0·56 mm. in length and 0·06-0·105 mm. in breadth. The intestinal bifurcation lies at a distance of 0·58-0·91 mm. from the anterior end. The posterior extension of intestinal caeca vary in different specimens from the anterior level of the posterior testis to the posterior level of the posterior testis. In some specimens the right intestinal caecum is larger than the left while in others the left is longer than the right one.

The excretory pore is terminal and leads into a Y shaped bladder. The two rounded testes are placed diagonally one behind the other in the posterior half of the body. The anterior testis is nearer to the left intestinal caecum and the posterior one to the right caecum. The anterior testis measures 0·56-0·63 × 0·56-0·72 mm. and is placed at a distance of 2·93-3·69 mm. from the anterior end. The posterior testis measures 0·56-0·7 × 0·5-0·67 mm. in size and is 0·39-0·7 mm. behind the anterior testis. The two vasaefferntia arise from the anterior aspect of the testes and unite to form a small vasdeferens at the base of the cirrus sac. The cirrus sac is long sac like with a tubular anterior part and extends to about the middle level of the ovary or ends a little infront of it. In size it measures 1·09-1·3 mm. in length and 0·29-0·35 mm. in breadth at the region of the sac. The vesicula seminalis occupies the basal part of the cirrus sac and a tubular parsprostatica surrounded by large number of prostate glands lies in the tubular neck like part of the cirrus sac. The genital pore is located above the ventral sucker in the median line inbetween the intestinal fork.

The ovary is situated on the left side close to the left intestinal caecum at a distance of 1·78-2·47 mm. from the anterior end. It measures 0·31-0·34 mm. × 0·25-0·31 mm. in size. The oviduct arising from the posterolateral aspect of the ovary after a short course receives a small duct from the receptaculum seminis. The receptaculum seminis is transversely placed and is a sac like structure measuring 0·63-0·70 mm. in length and 0·21-0·24 mm. in breadth.

The vitelline glands of the two sides extend to different levels anteriorly as well as posteriorly. The posterior extension of the vitellaria of the left side is always longer than that of the right side. Anteriorly the glands of both the sides extend to about the middle level of the cirrus sac, though in some specimens the level of extension is different on the two sides. The posterior extension of the vitellaria on the right side varies from the posterior level of the anterior testis to the anterior level of the posterior testis, while that of the left varies from midway between the two testes to the middle level of the posterior testis. The transverse vitelline ducts of the two sides unite to form a common duct above the receptaculum seminis.

The coils of the uterus pass between the two testes and continue upto the posterior end of the body. The terminal part of the ascending limb runs along the cirrus sac and opens into the genital atrium. The eggs are oval in shape and measure 0·024-0·027 mm. × 0·012-0·015 mm.

Astiotrema monticelli Stossich, 1904

Хозяин: уж— *Natrix* (=*Tropidonotus*) *viperinus*. Naples

Локализация: кишечник.

Место обнаружения: Италия.

Описание вида (из Мэра, 1931). Ротовая присоска немного превышает размер брюшной. Пищевод длинный, бифурцирует на кишечные ветви позади брюшной присоски. Кишечные ветви заканчиваются на уровне переднего края заднего семенника. Семенники лопастные, расположены слегка по диагонали. Яичник круглый. Желточники простираются от середины половой бурсы до середины переднего семенника.

Литература: Stossich, 1904, Mehra, 1931.

Plagiorchiidae

N.K. GUPTA, 1954

Astiotrema nathi, ~~n.sp.~~ (Fig. 1.)

Host .. .. *Lissemys punctata punctata.*
Location .. Intestine.
Locality .. Hoshiarpur (India).

Only two specimens of this species were obtained from the intestine a tortoise, *Lissemys punctata punctata*, collected from one of the local ds.

The live worm is somewhat yellowish in appearance. The contracted m is dorso-ventrally flexed. It is elliptical in shape with rounded erior and posterior ends, the latter is broader than the former. The m measures 4·08–5·304 mm. in length and 0·85 mm. in maximum dth across the middle region of the anterior testis. The body from level of the oral sucker up to the anterior testis is studded with small nes. Some of these spines are directed sidewardly and others back-rdly. In the whole mounts these can be seen prominently on the lateral sides. They are more closely arranged in the region of the oral sucke but they become gradually sparse posteriorly.

The oral sucker is at the anterior end and measures 0·225 mm. breadth and 0·210 mm. in length. It is larger than the ventral sucke which measures 0·18×0·18 mm. The ventral sucker is situated at a di tance of 0·65 mm. from the anterior end of the body. Just behind t oral sucker there is a short globular pharynx measuring 0·12×0·15 mm There is no prepharynx. The oesophagus measuring 0·51–0·525 mm. length and 0·045 mm. in width, is a long tubular structure arising from t base of the pharynx. At a distance of 0·195 mm. in front of the vent sucker it forks into two intestinal caeca which run along the lateral sid of the body and terminate blindly in level with the hinder margin of t posterior testis. The right intestinal caecum is slightly shorter than t left.

The male genital organs consist of two testes with irregular outlin and are placed obliquely in between the two intestinal caeca. The anteri testis measures 0·465–0·495 mm. in length and 0·345–0·375 mm. in max mum breadth. It is slightly notched on its anterior side. The posteri testis measures 0·51–0·525 mm. in length and 0·39–0·465 mm. in breadt and is placed at a distance of 0·045–0·345 mm. from the anterior testis a 0·969–1·394 mm. from the posterior end of the body. The two va efferentia, one from the notch of the anterior testis, the other from t anterior aspect of the posterior testis, arise and unite to form a small v deferens at the base of the cirrus sac. The cirrus sac is an elongat structure measuring 0·51–0·54 mm. in length and 0·225 mm. in maximu adth. It is median in position and extends posteriorly up to the level the middle of the ovary. It encloses the vesicula seminalis, pars pro-tica, ejaculatory duct and the cirrus. The vesicula seminalis is large d fills the major portion of the cirrus sac. The pars prostatica is also elongated structure surrounded by the prostate gland cells. It occupies e tubular region of the cirrus sac. The ejaculatory duct continues into e small cirrus. The male opening lies close to the female opening in the nital atrium in the space between the ventral sucker and the intestinal rk.

The female genital organs consist of an ovary situated on the right le close to the right intestinal caecum. It is at a distance of 0·405–5 mm. from the ventral sucker and measures 0·25–0·3 mm. in length and 1–0·255 mm. in breadth. From its postero-lateral aspect arises the iduct which, after a short course, receives the duct of the receptaculum minis. The receptaculum seminis itself is like a thick U-shaped sac and situated between the ovary and the anterior testis. The vitellaria are sent in follicles along the lateral sides of the body. They are mostly

-OVER-

A. impletum (Looss, 1899) differs from the new species. *A. nathi* differ from *A. odhneri* (Odhner, 1911) Bhalerao (1936) in which the testes a lobed and from *A. fukuii* Ogata (1938) in the position of the testes.

tra-caecal in position. The right vitellaria extends from the level of the terior margin of the ovary or base of the cirrus sac to the posterior margin the anterior testis, while the left vitellaria extends from the level of the ddle of the cirrus sac to about the middle or posterior margin of the terior testis. The vitelline follicles on both sides overlap one another d also cover a portion of the intestinal caeca. The two vitelline ducts ite mesially in front of the receptaculum seminis and form a yolk reser- r, the duct from which opens into the ootype, which is a dilated part of oviduct and is surrounded by the Mehlis' gland cells. The Mehlis' nd complex is median in position. The uterus is full of eggs. It first oceeds towards the posterior side of the body, where it is so much coiled at it becomes difficult to make out the descending and ascending limbs. e metraterm runs along the male genital duct and opens into a shallow rium situated in between the intestinal fork and the ventral sucker. e eggs measure 0·0238–0·034 × 0·0102–0·0136 mm.

Relationships

In *Astiotrema nathi*, n.sp., the oral sucker is larger than the ventral cker and in this respect it differs from all those species possessing larger ntral sucker, viz., *A. loossii* Mehra (1931), *A. spinosa* Chatterji (1933) d *A. orientale* Yamaguti (1937) and also from species with suckers of the me size, i.e., *A. indica* Thapar (1933) and *A. dassia* Dayal (1938). The w species can be distinguished from the undermentioned species in which e oral sucker is larger than the ventral sucker by the position of the latter *A. monticelli* Stossich (1904) in equal-sized testes and ovary in *A. ydis* Ejsmont (1930), in different extent of intestinal caeca and vitellaria *A. elongatum* Mehra (1931) and *A. rami* Bhalerao (1936).

A. nathi can be separated from *A. reniferum* (Looss, 1899) by the pe of testes and extension of vitellaria in the latter. In the position genital pore which is in front of intestinal fork and in the extension of tellaria from the middle of oesophagus to the middle of anterior testis,

Astiotrema odhneri Bhalerao, 1936

(Рис. 111)

Синоним: *Astiotrema reniferum* Odhner, 1911, nec Looss, 1898

Хозяин: черепаха — *Trionyx triunguis.*
Локализация: тонкие кишки.
Место обнаружения: Египет.

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FROM ODHNER, 1910

Astiotrema orientalis Yamaguti, 1937

Host: *Amyda japonica*

Astiotrema rami Bhalerao, 1936

Body elliptical. Length 1.96--3.63. Breadth 0.6--1.1. Oral sucker sub-terminal 0.235--0.35 dia. Ventral sucker 0.16--0.34 dia. Pharynx 0.06--0.135 dia. Esophagus 0.08--0.11 long. Intestinal caeca terminate 0.28--0.43 from the posterior end. Excretory bladder Y-shaped. Testes globular or irregular, 0.32--0.54 x 0.285--0.46. Cirrus sac 0.375--0.47 x 0.12--0.18, stout, protruding behind ventral sucker and stuated dorsally to it. Ovary at about anterior third of body, almost round, to the right, 0.17--0.33 x 0.225--0.32. Receptaculum seminis half moon-shaped, 0.27 x 0.12. Laurer's canal present. Vitellaria extend on the right side from the ovary to the anterior testis and on the left from the ventral sucker to the posterior testis or some distance behind it. Ova 0.04--0.0465 x 0.018--0.022.

Host: Lissemys punctata
Location: Intestine
Locality: Nagpur, C.P., India

The type slide deposited in the Helminthological Collection of the Imperial Institute of Veterinary Research, Muktesar.

Jour. Helm. 14 : 181-206. 1936

Astiotrema rami Bhalerao, 1936

Host : Lissemys punctata

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III. Plagiorchiinae Lühe (1901)

1. Astiotrema Looss (1900)

a) *Astiotrema rami* Bhalerao (1936). These distomes were obtained on several occasions from the intestine of the turtle, *Kachuga*

kachuga. The material studied agrees closely with the account of the species given by Bhalerao (1936). The various measurements of the species are recorded here:

Length, 2.8—4.17 mm.; maximum width, 0.93—1.2 mm.; oral sucker, 0.217—0.237 mm. in diameter; acetabulum, 0.198—0.217 mm. in diameter; pharynx, 0.1—0.12 mm. in diameter; oesophagus, 0.158 to 0.43 mm. long. Anterior testis, 0.168—0.375×0.514—0.554 mm.; posterior testis, 0.396—0.475×0.396—0.54 mm.; cirrus sac, 0.99—1.1 mm. Ovary, 0.217—0.257×0.217—0.277 mm.; eggs, 0.040—0.046×0.019 to 0.021 mm. — This species is recorded for the first time from Hyderabad (Dn).

Host: *Kachuga kachuga*. — Habitat: Intestine. — Locality: Hyderabad, India.

b) *A. loossii* Mehra (1931). Numerous specimens of *A. loossii* Mehra, 1931, were obtained from the intestine of turtle, *Kachuga kachuga*. The description of this species given by Mehra (1931) and Bhalerao (1936) were based on single specimen in each case. The various measurements given below cover a wider range in size:

Length, 3.5—7.81 mm.; breadth, 1.36—2.17 mm.; oral sucker, 0.198 to 0.237 mm. in diameter; ventral sucker, 0.257×0.336 mm.; pharynx, 0.138—0.178 mm. Oesophagus, 0.297—0.336 mm. long. Ovary, 0.356 to 0.612×0.237—0.376 mm. Anterior testis, 0.54—1,06×0.514—0.89 mm.; posterior testis, 0.594—0.93×0.554—0.73 mm.; cirrus sac, 0.514 to 1.16×0.178—0.455 mm. Eggs, 0.013—0.028×0.004—0.006 mm.

Host: *Kachuga kachuga*. — Habitat: Intestine. — Locality: Hyderabad, India.

From Simha, 1958

Astiotrema spinosa Chatterji, 1933

(Рис. 113)

Хозяева: черепаха — *Amyda sinensis*, рыба из сем. сомовых — *Clarias batrachus*.

Локализация: кишечник.

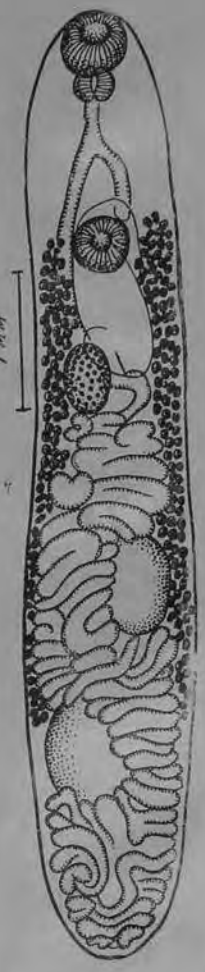
Места обнаружения: Индия и СССР (озеро Ханка).

Историческая справка. В 1933 году индийский гельминтолог Чаттержи (Chatterji) описал этот вид от черепахи из Индии. Вторично эта трематода была найдена советским исследователем Белоус у дальневосточных черепах *Amyda sinensis*, пойманных в Приморском крае на озере Ханка. Белоус вскрыла 93 экземпляра черепах и только у трех обнаружила этих паразитов. Число трематод в одной черепахе колебалось от одного до четырех экземпляров.

Описание вида (по Белоус, публикуется впервые). Тело трематод удлиненное, с более или менее параллельными боковыми краями. Передний и задний концы одинаково закруглены. Длина тела равна 6,9 мм, ширина — 1,2 мм. Ротовая присоска расположена субтерминально, 0,410 мм в диаметре. Брюшная присоска отстоит от ротовой на расстоянии, несколько превышающем одну пятую часть тела; ее диаметр равен 0,380 мм. Кутикула покрыта острыми шипиками, которые в передней части тела сидят очень густо, один возле другого, а по направлению кзади они располагаются все более редко и совершенно исчезают на уровне заднего семенника. Имеется короткий префаринкс, который не всегда обнаруживается на препаратах. Фаринкс 0,260 мм длины и 0,30 мм ширины. Пищевод 0,300 мм длины. Развилок кишечника находится на уровне середины расстояния между присосками. Кишечные стволы заканчиваются позади второго семенника близ заднего конца тела. Несколько позади середины длины тела находится передний семенник, имеющий продольно-овальную форму; он сдвинут к левому краю тела. Второй семенник лежит на значительном расстоянии позади переднего, возле правого края тела. Размер семенников равен 0,800 × 0,620 мм.

Половая бурса очень крупная; она располагается позади брюшной присоски, заходя передним концом вперед и дорзально от нее. Полость бурсы целиком заполнена семенным пузырьком. Длина бурсы 1,2 мм, ширина — 0,440 мм. Половые отверстия открываются впереди брюшной присоски у ее переднего края.

Яичник находится справа от дна бурсы; его размер 0,540 × 0,400 мм. Желточники состоят из четких некрупных фолликулов, проходящих двумя довольно плотными боковыми полосами от уровня середины или даже переднего края брюшной присоски до уровня середины передней половины второго семенника. Матка сильно развита; она состоит из очень большого числа петель, которые заполняют пространство между задним краем тела и яичником. Кпереди от дна бурсы матка идет до полового отверстия, не образуя петель, а лишь слабо извиваясь. Размеры яиц 0,027 × 0,012 мм



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Литература: Chatterji, 1933, стр. 33—35; Белоус, 1954 (диссертация).

N. K. Gupta, 1954

Astiotrema srivastavai, ~~n. sp.~~ (Fig. 3.)

Host ..	..	*Lissemys punctata punctata.*
Location	..	Intestine.
Locality	..	Hoshiarpur (India).

A single slightly mature specimen of *Astiotrema srivastavai* was obtained from the intestine of a tortoise examined at Hoshiarpur. It is a small elliptical worm measuring 1·64 mm. in length and 0·64 mm. in maximum breadth across the region of intestinal fork. The cuticle is covered with small backwardly directed spines. The subterminal oral sucker measuring 0·102 mm. in length and 0·153 mm. in breadth is smaller than the ventral sucker which measures 0·17 × 0·17 mm. and is situated at a distance of 0·153 mm. from the intestinal fork. The prepharynx is absent. The pharynx is globular, 0·06 × 0·112 mm. in dimensions. The oesophagus is 0·221 mm. long, bifurcating 0·153 mm. in front of the ventral sucker. The right intestinal caecum terminates in the first half and the left in the second half of the posterior testis but not extending beyond it.

The two testes are present in the second half of the body. The anterior margins are notched. The anterior testis is 0·272 mm. long, 0·357 mm. broad, while the posterior testis measures 0·255 mm. in length and 0·272 mm. in breadth. The cirrus sac is large, curved and extends along the left margin of the ventral sucker. Posteriorly it extends up to the antero-lateral margin of the ovary. The genital pore is median just in front of the ventral sucker.

The spherical ovary measuring 0·119 × 0·119 mm. is situated close to the right intestinal caecum in the anterior region of the second half of the body. The Mehlis' gland complex is placed to the left of the ovary. The receptaculum seminis is small situated transversely behind the Mehlis' gland complex and inner half of the ovary.

The vitelline glands consist of small follicles confined to the lateral areas, extending from the genital pore to the posterior margin of the anterior testis. Eggs are few and measure 0·024 × 0·008 mm.

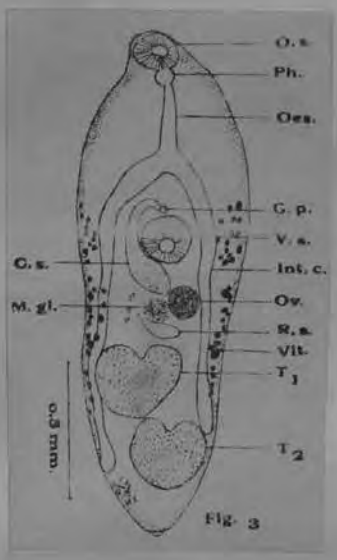

Fig. 3

Relationships

The specimen described above differs from all the species of the genus *Astiotrema* in which the oral sucker is either equal to or larger than the ventral sucker. Therefore, in respect of the size of the oral sucker as compared with that of the ventral sucker, it resembles *A. loossii*, *A. spinosa* and *A. orientale*.

The extent of intestinal caeca, lobed condition of the testes, kidney-shaped ovary, the extent of vitellaria, different size of its eggs separate *A. loossii* from the new species—*A. srivastavai*. In *A. spinosa* the intestinal caeca extend behind the posterior testis, the slightly lobed testes are in tandem in position, the vitellaria extend from the posterior margin of the ventral sucker to the anterior or hinder margin of the posterior testis and the size of the eggs, which distinguish it from the new species. The extent of vitellaria, the shape of testes and ovary in *A. orientale* separate it from the new species.

Pending a study of fully mature forms, this parasite is assigned tentatively to a new species on account of the length of its intestinal caeca, the equatorial position of the ovary and the location of the testes in the anterior half of the body.

Plagiorchidae

Astiotrema sudanensis Khalil,1959

Journal of Helminthology, Vol. XXXIII, No. 4, 1959, pp. 283-288.

On a New Trematode, *Astiotrema sudanensis*, sp. nov., from a Freshwater Turtle in the Sudan

By L. F. KHALIL

From the Department of Parasitology, London School of Hygiene and Tropical Medicine

Seven specimens of this new species were collected from the intestine of a freshwater turtle, *Trionyx triunguis* (=*T. nilotica*) in the Sudan.

These are lanceolate worms which gradually taper to rounded ends, with a length of 2·5–2·9 mm. and a width of 0·6–0·9 mm. The cuticle is invested with scales, dense in the anterior half of the worm, but becoming more and more sparse towards the caudal end. The oral sucker is large, measuring 0·23–0·27 mm. in diameter and is about one and a half times the diameter of the ventral sucker which measures 0·14–0·17 mm. in diameter. Both suckers lie in the anterior half of the body. The mouth is subterminal and leads to a pharynx which is stout, 0·7–0·8 mm. by 0·11–0·12 mm., and leads to a long oesophagus of 0·25–0·32 mm. in length. The caeca terminate at the posterior border of the posterior testis or slightly anterior to it.

The testes are smooth, more or less rounded, and diagonal in position; the anterior testis is to the right and measures 0·22–0·30 mm., by 0·28–0·38 mm., and the posterior testis to the left measuring 0·28–0·35 mm. by 0·30–0·40 mm. The cirrus sac is large, 0·51–0·60 mm. in length, and extends posteriorly as far as the level of the ovary. It encloses a large seminal vesticle, a long pars prostatica surrounded by prostate cells, and a short cirrus. The genital atrium is immediately preacetabular, a very short distance posterior to the intestinal bifurcation.

The roughly spherical ovary is situated to the left side and measures 0·16–0·21 mm. in diameter. The seminal receptacle is pear-shaped. The follicular vitellaria extend along the lateral fields, but sometimes overlap the intestinal caeca, occupying an area between the middle of the oral sucker to the level of the posterior border of the anterior testis. The uterus descends between the testes to the caudal end of the worm before ascending to the genital pore. Eggs are numerous, elongated, thin shelled, measuring 29–31μ by 8–10μ.

DISCUSSION

Prior to the review of the genus *Astiotrema* by Yeh and Fotedar (1958), the genus, according to published works, contained 21 species. These two authors proposed to transfer *Astiotrema emydis* Ejsmont, 1930, to *Leptophallus*. Of the remaining species, their studies have shown that only four species were valid. These are :—

1. *Astiotrema reniferum* (Looss 1898) Looss, 1900.
2. *Astiotrema impletum* (Looss, 1899) Looss, 1900.
3. *Astiotrema monticelli* Stossich, 1904.
4. *Astiotrema odhneri* Bhalerao, 1936.

The only difference of importance reported by Yeh and Fotedar (1958) between *A. reniferum* and *A. odhneri* is the extension of the intestinal caeca. The writer studied specimens collected from the intestine of the freshwater turtle *Trionyx triunguis* in the Sudan and found that in some of the specimens the caeca terminate near the posterior extremity of the worm, in other specimens they terminate at the posterior border of the posterior testis. There were ranges in between these two extremes as well. This leads to the conclusion that *A. odhneri* is a synonym of *A. reniferum*. In fact Odhner (1911) when he first found that species described it as *A. reniferum*. The other differences described by Bhalerao (1936) regarding the shape and lobulation of the testis were shown later by Yeh and Fotedar (1958) to be of no value. Dr. Yeh (personal communication) agrees with this synonym.

A. reniferum was reported from only one fish, *Clarias batrachus* from Burma and India. The writer found it also in the intestine of the freshwater fish, *Clarias lazera* in the Sudan. This is the first time it has been reported from that host.

In 1958 also another species was reported by W. A. Siddiqui, namely *Astiotrema geomydia* from the intestine of the tortoise *Geoemyda spinosa*. This species does not fit in with the key of the genus given by Yeh and Fotedar, and gives us four valid species so far.

As it was not possible to assign the species under consideration to any of the four species mentioned above, it is considered to be a new species for which the name *Astiotrema sudanensis* is proposed.

A. sudanensis sp. nov. resembles *A. reniferum* to some extent, but differs from it in the relative size of the two suckers, the extension [illegible] smaller [illegible]

Key to the Species of Astiotrema

1. Oral and ventral suckers roughly of equal size..... 2
   Oral suckers larger than ventral sucker..... 3

2. Caeca terminating about the middle of body, vitellaria restricted to second quarter of the body, intestinal bifurcation posterior to ventral sucker.....*A. monticelli*
   Caeca longer than above, vitellaria more dispersed intestinal bifurcation anterior to ventral sucker.....*A. reniferum*

3. Genital pore not posterior to intestinal bifurcation *A. impletum*
   Genital pore posterior to intestinal bifurcation..... 4

4. Vitellaria extending from the middle of the ventral sucker .....*A. sudanensis* sp.nov.
   Vitellaria extending from the level of the cirrus sac *A. geomydia*

Astiotrema sudanensis Khalil, 1959

(Fig. 23)

Twenty-one specimens of this species were collected from intestine of a freshwater turtle, *Lissemys punctata* from the Balloki Headworks (River Ravi).

These are lanceolate worms broadly rounded at the posterior extremity and comparatively narrow at the anterior end. The tegument is invested with numerous small spines which are dense in the anterior part of the body but become gradually sparse towards the posterior side and extend to nearly middle or the anterior two-third of the body. The oral sucker is globular, subterminal in position and larger than the ventral sucker. The ventral sucker lies in the anterior half of the worm. A small prepharynx is present. The pharynx is small, globular and followed by a long oesophagus which bifurcates in front of the ventral sucker. The intestinal caeca are variable in their extent and may terminate anywhere between a little in front of the anterior testis and a little beyond the posterior testis.

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The testes are in the posterior half of the body and are diagonally placed. They are almost rounded. The anterior testis is a little to one side of the median line and is only slightly smaller than the posterior. The cirrus sac is large and extends posteriorly beyond the ovary as far as the anterior margin of the anterior testis or slightly in front of it. It encloses a large seminal vesicle, pars prostatica surrounded by prostatic glands, and a short unarmed cirrus. The genital opening is just preacetabular. The ovary is roughly spherical, equatorial or slightly post-equatorial and a little to the left of the median line. The vitellaria are follicular usually confined to the extracaecal fields but sometimes overlapping the caeca or even intruding into the intercaecal area. The vitellaria extend between the acetabulum and the posterior border of the posterior testis with slight variations. The uterus is comparatively less extensive. It passes between the two testes, descending to some distance in front of the posterior extremity of the worm, then it ascends and runs parallel to the cirrus sac opening into the genital aperture. The oval eggs are fairly numerous, light yellow in colour, thin shelled, operculate and unembryonated The excretory bladder is Y-shaped with a long stem and short arms.

Host: *Lissemys punctata*
Location: Intestine
Locality: Balloki Headworks (river Ravi)

Discussion

The material under study resembles *Astiotrema sudanensis* Khalil, 1959 in all essential features. The worms collected by Khalil (1959) are larger with proportionately larger structures. However, the egg size is same in both the cases. The specimens under study are, therefore, identified as *Astiotrema sudanensis* Khalil, 1959. They have been reported for the first time from Pakistan.

Measurements

(All measurements in millimetres)

Body length	1.242 – 2.121
Body breadth	0.333 – 0.424
Oral sucker	0.127 – 0.176 × 0.147 – 0.196
Pharynx	0.058 – 0.081 × 0.068 – 0.081
Oesophagus	0.196 – 0.303
Ventral sucker	0.091 – 0.127 × 0.096 – 0.119
Ovary	0.088 – 0.127 × 0.068 – 0.117
Anterior testis	0.117 – 0.196 × 0.107 – 0.166
Posterior testis	0.125 – 0.225 × 0.107 – 0.166
Shell gland	0.049 × 0.068
Cirrus sac	0.343 – 0.490
Eggs	0.015 – 0.030 × 0.012 – 0.015

From BHUTTA AND KHAN, 1975

ASTIOTREMA SUDARSHANI n. sp. MUKHERJEE AND GHOSH, 1970
(Fig. 1)

Four mature forms of this parasite were collected from the intestine of *Bufo melanostictus*. This is the first record of a species of the genus *Astiotrema* Looss, 1900 from amphibia in this country. The other species recorded abroad from amphibians are *Astiotrema monticelli* Stossich, 1904, *A. trituri* Grabda, 1959 and *A. (Biguetrema) tananarivense* Deblock and Capron, 1962.

Fig 1

Body elongated with rounded extremities, measuring 1.46-1.77× 0.63-0.65*. Cuticle covered with conspicuous spines which extend upto the posterior level of posterior testis and thickly arranged upto the posterior level of ventral sucker. Oral sucker globular, subterminal and measures 0.13-0.14×0.13-0.15. Ventral sucker situated in posterior portion of anterior third of body length, almost of the size of the oral sucker, round and measures 0.12-0.14 in diameter. Mouth subterminal. Prepharynx very small, leads to pharynx which measures 0.05-0.11× 0.07-0.09. Oesophagus S-shaped, small 0.04 in length and bifurcates at anterior to ventral sucker. Caeca extend upto middle or anterior level of posterior testis.

Testes triangular, diagonally tandem, posterior to ventral sucker, in equatorial zone. Anterior testis measures 0.15-0.22×0.28-0.34, posterior testis 0.11-0.24×0.31-0.37. Curved cirrus sac extends much posterior to ventral sucker, encloses seminal vesicle, short pars prostatica and protrusible cirrus measures 0.27-0.38×0.07—0.16.

Oblong ovary located in between anterior testis and ventral sucker measures 0.11-0.13×0.13-0.18. Receptaculum seminis well developed, transversely elongated, between anterior testis and ovary. Uterus with numerous transverse coils, fills whole of posterior part of body and extend between testes and at places overlaps caeca. Genital pore immediately in front of ventral sucker and median. Follicular vitellaria lateral, extracaecal or at places overlaps caeca, extends from bifurcal zone to almost caecal termination and sometimes asymmetrical. Excretory bladder Y-shaped with long stem and excretory pore subterminal. Eggs yellowish and measure 0.029-0.034×0.010-0.017.

The present species comes close to *A. trituri* Grabda, 1959 but it differs from the known form in the extension of cuticular spines, size of prepharynx, position of ventral sucker, size of testes, shape of ovary, extension of vitellaria, size of cirrus sac and smaller size of eggs.

YEH and FOTEDAR (1958) have gone too far in synonymysing the species of the genus *Astiotrema* Looss. 1900 by not considering the distribution of cuticular spines, shape, size and position of testes and host specificity. As such this genus needs further revision, taking into consideration the life histories of the various species elucidated so far beside other factors to establish the validity of the species.

We name this species to honour the memory of Shri Sudarshan Chandra Roy, whose tragic death has removed a promising young scientist from the field of Helminthology.

— OVER —

Host : *Bufo melanostictus*.
Location : Intestine.
Locality : Birati (West Bengal).

Holotype (No. W 6877/1 on slide) and paratypes (Nos. W 6878/1 & 6879/1 on slides) have deposited in the National Zoological Collection at the Zoological Survey of India, Calcutta.

N.K. Gupta, 1954

Astiotrema thapari, ~~n.sp.~~ (Fig. 4.)

Host .. .. *Lissemys punctata punctata.*
Location .. Intestine.
Locality .. Hoshiarpur (India).

Only one specimen of this parasite was found in the intestine of a tortoise caught in a stream in Hoshiarpur. It is an elongated flat worm, with rounded anterior and posterior ends. It is 9 mm. long and 2·28 mm. broad just in front of the anterior testis. The cuticle is spinous, the spines being small. The mouth is subterminal or terminal and lies in the centre of the oral sucker, which measures 0·408 mm. in length and 0·425 mm. in breadth. Prepharynx is absent. The globular pharynx 0·238×0·289 mm. in size, is next to the oral sucker. The oesophagus is small, bent in the whole mount probably due to the contraction. It is 0·473 mm. in length. It forks at a distance of 0·765 mm. in front of the ventral sucker into two intestinal caeca which terminate behind the posterior testis. The ventral sucker, measuring 0·408×0·425 mm., lies at a distance of 0·765 mm. from the intestinal fork, and is equal to the oral sucker.

The two testes are irregular in outline and are placed obliquely in the inter-caecal zone. The anterior testis is 0·952 mm. long and 1·037 mm. broad, lying close to the left intestinal caecum. The posterior testis is slightly larger than the anterior testis and is separated by a distance of 1.037 1·037 mm. from the latter. It is 1·071 mm. long and 1·105 mm. broad and lies near the right intestinal caecum. The vas efferens arises from the anterior pointed aspect of each testis. The cirrus sac is about 1·28 mm. long and 0·40 mm. in its maximum breadth. It is placed obliquely in between the ovary and the ventral sucker, extending from the level of the middle of the ovary up to slightly in front of the anterior margin of the ventral sucker. During its course it partly overlaps the ventral sucker. The genital pore lies just in front of the ventral sucker.

The ovary is spherical measuring 0·544×0·595 mm. It is placed to the right of the median line close to the right intestinal caecum. The Mehlis' gland complex is to the left of the ovary. The receptaculum seminis, 0·765×0·357 mm. in size, lies behind the ovary. The vitellaria consist of small follicles and are confined to the lateral sides extending from the level of half-way between the intestinal fork and ventral sucker to the middle of the posterior testis. Eggs measure 0·028–0·032×0·0[illegible]–0·012 mm.

Relationships

In *Astiotrema thapari*, n.sp., the oral sucker is equal to the ventral sucker. Therefore, it stands apart from all the species in which oral sucker is either larger or smaller than the ventral sucker. In the relation of oral sucker with the ventral sucker, the new species *A. thapari* resembles *A. indica* and *A. dassia*, but it differs from them in the shape of testes, the ovary and in the extent of the vitellaria. In the new species the cirrus sac and the ovary are on the same side.

ASTIOTREMA

Bierlinae Freitas, 1956

Subfamily diagnosis. — Plagiorchiidae: Body slender, enlarged in region of acetabulum, spinose. Oral sucker small, followed by distinct prepharynx. Esophagus short, ceca terminating some distance short of posterior extremity. Acetabulum near anterior extremity. Testes tandem or oblique, in middle third of body. Cirrus pouch transverse, preacetabular; genital pore lateral, preacetabular. Ovary median, pre-equatorial. Receptaculum seminis and Laurer's canal present. Vitellaria surrounding ceca from in front of ovary to behind cecal ends. Uterus reaching to posterior extremity. Parasites of snakes.

Bieriinae subfam. n.

Teixeira de Freitas (1956) Rev. Brasil. Biol.

Opisthogonimidae. Corpo foliáceo, alongado. Poro genital pré-acetabular, marginal. Bolsa do cirro pequena, pré-acetabular. Testículos levemente alongados no sentido longitudinal, no mesmo campo e com zonas um pouco afastadas. Ovário arredondado, pós-acetabular, no campo dos testículos e com zona afastada da do testículo anterior e ainda mais afastada da zona do acetábulo. Vitelinos pós-acetabulares.

Gênero tipo e único — *Bieria* Leão, 1946, sòmente com a espécie tipo: *B. artigasi* Leão, 1946.

Bieria Leão, 1946

Generic diagnosis. — Plagiorchiidae, Bieriinae: Body long, slender, spinose, with maximum width at level of acetabulum. Oral sucker subterminal, smaller than acetabulum; prepharynx present, esophagus short, ceca terminating some distance short of posterior extremity. Acetabulum near anterior extremity. Testes rounded or oval, tandem, sometimes oblique, in middle third of body. Cirrus pouch situated transversely between intestinal bifurcation and acetabulum, containing winding tubular seminal vesicle, ejaculatory duct and unarmed cirrus. Genital pore lateral, pre-acetabular, postbifurcal. Ovary median, a short distance anterior to anterior testis. Receptaculum seminis and Laurer's canal present. Vitellaria intercecal, cecal and extracecal, extending from in front of ovary to behind cecal ends. Uterus intercecal, cecal and postcecal, reaching to posterior extremity; eggs small. Excretory vesicle Y-shaped, with unequal arms. Parasitic in lung of snakes.

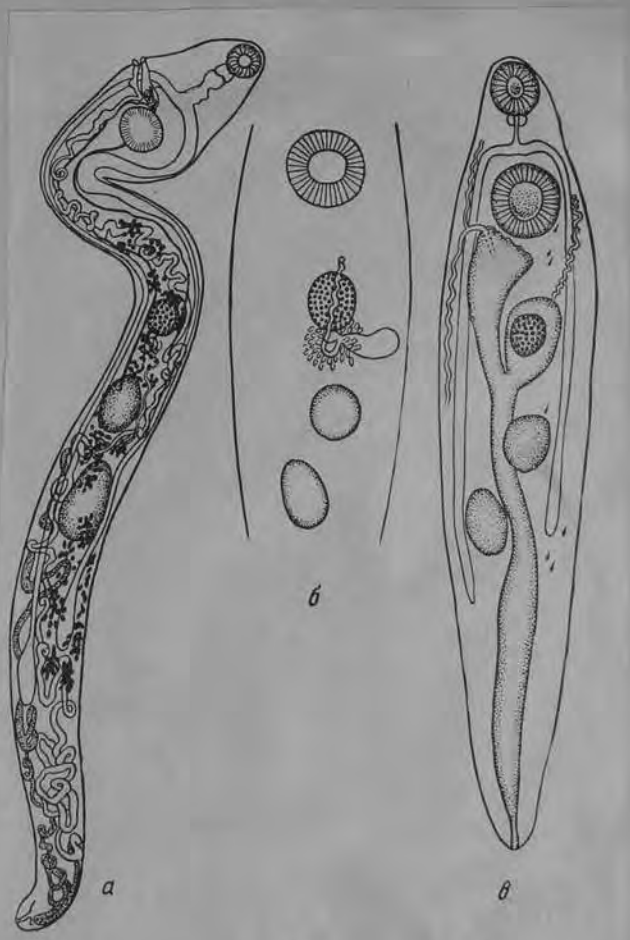
Genotype: *B. artigasi* Leão, 1946 (Pl. 60, Fig. 729), in *Liophis miliaris;* Brazil.

Bieria artigasi Leão, 1946

(Рис. 177)

Хозяин: змея — *Liophis miliaris*.
Локализация: легкие.
Место обнаружения: Бразилия.

Описание вида (по Леао, 1946). Очень крупные трематоды с закругленным передним концом и суженным задним. Тело 10—17 мм длины при максимальной ширине 1,159—2,024 мм на уровне брюшной присоски. Кутикула покрыта шипиками, наиболее многочисленными в передней половине тела, где они также длиннее, чем в задней. По направлению к заднему концу тела число шипиков уменьшается, а сами они становятся более короткими и совершенно исчезают в задней четверти длины тела. Ротовая присоска субтерминальная, направленная в вентральную сторону, круглая, меньшего размера, чем брюшная присоска; длина ее достигает 0,405—0,552 мм при ширине 0,478—0,662 мм. Префаринкс 0,038—0,212 мм длины. Фаринкс мышечный, 0,152—0,266 мм длины и 0,228—0,381 мм ширины; он окружен клетками железистого характера. Пищевод короткий, 0,404—0,552 мм длины. Брюшная присоска лежит впереди середины тела, приблизительно на расстоянии $^1/_6$ длины от его переднего конца и достигает 0,644—0,959 мм длины и 0,607—1,067 мм ширины. Расстояние между присосками 1,067—1,564 мм. Кишечные стволы простые, более или менее прямые, неодинаковой длины, оканчиваются на расстоянии 3,467—5,888 мм от заднего конца тела. Семенники расположены приблизительно на уровне середины тела, между кишечными стволами и в их области. Семенники могут быть округлыми, овальными или грушевидными, с гладкой поверхностью; передний семенник почти всегда бывает шаровидный, 0,625—0,920 мм длины при ширине



BIERIA

LOOSE LEAF INDEX

URABLE INDEX
VIDERS, SUITABLE
OR SCHOOL OR
OMMERCIAL USE.

IDEAL FOR CLASSIFYING, OR SEPARATING STUDIES, VARIOUS SUBJECTS OR MISCELLANEOUS DATA.

me _____ Telephone _____

dress _____

hool _____ Class _____

urse _____ Year _____

SUBJECTS

_____ _____

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CLASS SCHEDULE

PERIOD	FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH	SEVENTH	EIGHTH
DAY COURSE								
INSTRUCTOR								
SDAY COURSE								
INSTRUCTOR								
NESDAY COURSE								
INSTRUCTOR								
RSDAY COURSE								
INSTRUCTOR								
AY COURSE								
INSTRUCTOR								
URDAY COURSE								
INSTRUCTOR								

STANDARD PUNCHING FOR 11x8½ SIZE BINDER

Bilorchis Mehra, 1937

Generic diagnosis.—Plagiorchiidae, Plagiorchiinae. Body more tapered anteriorly than posteriorly. Acetabulum comparatively small, about one-third of body length from anterior extremity. Oral sucker well developed, followed by prepharynx. Esophagus very short; ceca reaching almost to posterior extremity. Testes practically symmetrical, in middle third of body. Cirrus pouch short or long, extending to middle of acetabulum, enclosing coiled seminal vesicle, tubular pars prostatica surrounded by well developed prostate cells, and short unarmed cirrus. Ovary posterolateral to acetabulum; no receptaculum seminis. Uterus strongly convoluted, occupying entire posttesticular area, overreaching ceca laterally; eggs small. Vitellaria extending in lateral fields from level of intestinal bifurcation to near cecal ends. Excretory vesicle? Parasitic in gall bladder of freshwater tortoises.

Genotype: *B. indicus* Mehra, 1937 (Pl. 51, Fig. 625), in *Lissemys punctata*; India.

Bilorchis Mehra, 1937

Body dorso-ventrally flattened, anterior end somewhat attenuated, posterior end broad and rounded. Suckers nearly equal. Pre-pharynx present; pharynx of characteristic form; oesphagus short; intestinal caeca reaching a little in front of hinder end. Genital opening submedian, a little behind intestinal bifurcation or about midway between it and ventral sucker. Testes symmetrically situated, parallel at about middle of body length or just behind. Cirrus sac short, median, somewhat oval or more elongated and narrower, extending up to middle of ventral sucker. Vesicula seminalis coiled; pars prostatica tubular; prostate gland cells well developed; cirrus short, unarmed. Ovary pretesticular, sinistral, rounded close outside left posterior quadrant of ventral sucker and projecting behind it; receptaculum seminis absent. Uterus large, massive, convoluted, filling almost post-testicular region; metraterm short, opposite or adjacent to cirrus sac. Vitellaria much elongated, band-like, confined to edges of body and composed of small follicles, extending from intestinal bifurcation to a little distance in front of hinder end. Ova oval with a thin shell, yellow brown, 0.033--0.036 in length and 0.0195--0.021 in maximum breadth. Parasitic in gall bladder of fresh water tortoise, Lissemys punctata.

Type species: Bilorchis indicum n. sp.

(10) *Bilorchis indicum* nov. gen., nov. spec. — Figs. 10 and 11

Fig. 10. Dorsal view of *Bilorchis indicum* sp. n. Lettering see Fig. 1.

Fig. 11. Ventral view of *Bilorchis* [illegible] sp. n.

Host: *Lissemys punctata* Malcolm Smith. — Position: Gall bladder. Frequency: Present in two out of many hosts examined. — Lowar Allahabad, U.P. (India)

Bilorchis indicus Mehra, 1937

(Fig. 22)

The following description is basdd on a single immature specimen recovered from the gall bladder of one out of three specimens of *Lissemys punctata* from Panjnad Headworks.

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The body of the fluke is leaf-like, somewhat oblong with broadly rounded extremities and maximum width at about the middle of the body. The tegument is unarmed. The oral sucker is subterminal. The ventral sucker is slightly smaller than the oral and is situated at about one-third of the length from the anetrior end. A short prepharynx is present. The pharynx is globular. The oesophagus is short and divides into two intestinal caeca at a distance of 0.490 mm from the anterior extremity of the worm. The caeca are slender and terminate near the posterior end.

The testes are equatorial and symmetrical in position and unequal in size. Both the testes are transversely elongated. The cirrus sac is of medium size, extending to the level of anterior third of the ventral sucker. The genital pore is postbifurcal and submedian. The cirrus sac encloses a coiled tubular vesicula seminalis, a ductus ejaculatorius, a tubular pars prostatica and a short unarmed cirrus. The ovary is submedian, lying immediately in front of the right testis. The vitellaria consist of numerous extremely small follicles which are extracaecal in position and extend from the level of oral sucker to a little in front of the posterior end of the caeca. The uterus is thrown into numerous irregular transverse coils which occupy the intercaecal space from the acetabular level to near the posterior end. The specimen available is immature and does not contain any eggs. Mehra (1937) was unable to see the excretory vesicle which was completely obliterated by the uterine coils in his specimen. Because of the immaturity of the present specimen the excretory vesicle is clearly visible. It is Y-shaped with a very long stem swollen at its base. It receives the two cornua some distance behind the testes. The cornua extend to the level of the oral sucker. The excretory pore is terminal.

MEASUREMENTS

(All measurements in millimetres)

Body length	2.636
Body width	1.212
Oral sucker	0.264×0.313
Ventral sucker	0.275×0.275
Pharynx	0.117×0·117
Oesophagus	0.147
Ovary	0.127×0.147
Testes	0.098–0.156× 0.166–0.235
Mehlis' gland	0.107–0.137
Cirrus sac	0.213

Host: *Lissemys punctata*
Location: Gall baldder
Locality: Panjnad

DISCUSSION

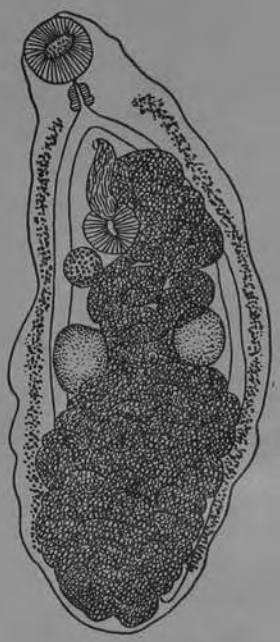
The present fluke resembles *Bilorchis indicus* Mehra, 1937 in all essential features and has been identified as such. However, it has been recorded for the first time from Pakistan.

From BHUTTA AND KHAN, 1975

Bilorchis indicum Mehra, 1937

(Рис. 178)

Хозяин: пресноводная черепаха — *Lissemys punctata* Malcolm Smith.
Локализация: желчный пузырь.
Место обнаружения: Индия.



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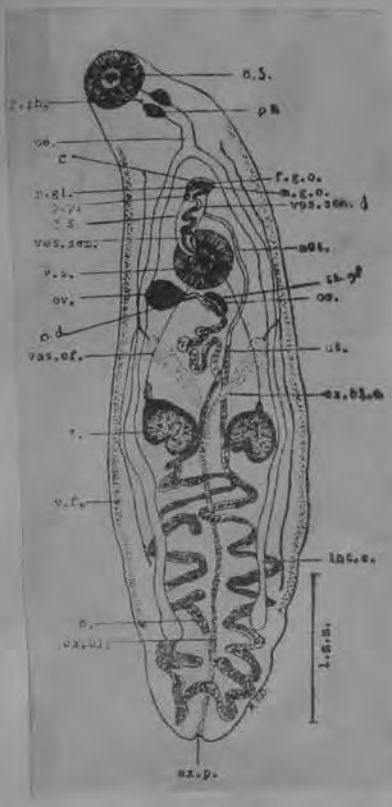
BILORCHIS MEHRAI — DWIVEDI, 1965

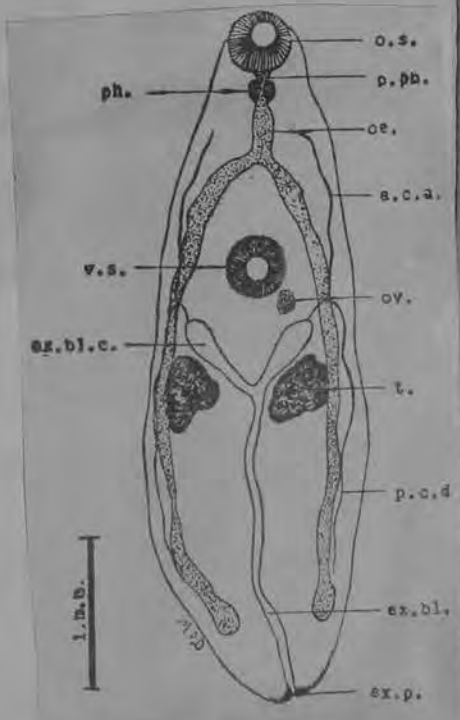
Body is thin, delicate, transparent, dorsoventrally, flattened, measuring 4.54-4.59 × 1.27-1.44 mm., the maximum breadth being at the equatorial region. Anterior end attenuated, completely occupied by oral sucker. Posterior end rounded with a central and median terminal notch which receives the opening of excretory bladder. General surface of body covered by thin cuticle with backwardly projecting minute spines, measuring 0.0062-0.0066 mm. When dorsoventrally flattened, shape of body is elliptical. Oral sucker subterminal perfectly rounded with diameter 0.37 mm., posterior wall slightly thicker than anterior one. Ventral sucker little larger than oral sucker, measuring 0.405-0.41 × 0.37-0.405 mm, situated little less than one third of body length from the anterior end. Ratio of oral sucker to ventral sucker is 6 : 7. Mouth encircled by oral sucker measures 0.105 mm. Prephrynx well developed, tubular, measuring 0.086-0.087 × 0.045-0.046 mm. Pharynx well developed, muscular band-like, with anterior wall 0.126-0.135 mm., larger than posterior wall 0.096-0.105 mm., with maximum breadth in the middle 0.171-0.174 mm. Oesophagus long, tubular measuring 0.33-0.36 mm. Intestinal caecum simple, long, reaching fairly upto posterior extremity, dilated at the end, leaving 0.375 mm. from the end.

Excretory opening median, terminal lodged in a notch. Excretory bladder, measuring 1.74-1.87 mm. long, slightly wavy producing two cornua at the level and in between two testes. Excretory bladder cornua distended distally, measuring 0.63-0.64 mm., receive anterior and posterior collecting ducts which run parallel to the intestinal caecum.

Testes symmetrical, parallel, unequal, lobed (2-3 lobes), and a little below the middle of body length. Testicular zone, measuring 0.27-0.48 × 0-221-0.224 mm., with intertesticular space measuring 0.32 mm. Vasa efferentia arising from anterior terminal end of testes, unite dorsally to ventral sucker in its middle region to form vas deferens ; vas deferens very short, measuring 0.119-0.12 mm. Cirrus sac disposed obliquely between intestinal bifurcation and ventral sucker, extending upto the middle of ventral sucker, measuring 0.555-0.615 × 0.120-0.180 mm. Vesicula seminalis coiled, present in the proximal part of cirrus sac. Pars prostatica tubular, surrounded by prostatic gland cells. Cirrus short, unarmed, measuring 0.114 mm. Genital opening submedian, dextral, just below the intestinal bifurcation.

Ovary nonlobulated, entire margin, pear shaped, sinistral, closed outside left posterior quadrant of ventral sucker, projecting behind it, measuring 0.36-0.361 × 0.22-0.24 mm. Receptaculum seminis absent. Laurer's canal present, arising before the formation of ootype and measuring 0 16-0.18 × 0.015-0.024 mm. Ootype, pear shaped receiving





-OVER-

below the yolk reservoir, measuring 0.18-0.19×0..036-0.045 mm. Uterus arising from the right outside of ootype, long, convoluted thin intercaecal or overlapping the caeca and reaching posterior extremity beyond intestinal caecum. Soon after its origin it crosses left cornua of excretory bladder descends in a zig-zag way, reaches posterior extremity, crosses the excretory bladder, ascends again in a zig-zag way upto ventral sucker, passes to left of cirrus sac, forming metraterm which curves in sigmoid notch to open immediately above the male genital opening, little towards right side. Vitellaria much elongated band-like in the extreme lateral edges, extracaecal, extending little in front of the intestinal bifurcation and their termination. Eggs a few, embryonated, thin yellow brown shelled, operculated, measuring 0.033-0.036 × 0.018-0.024 mm.

Host : *Kachuga intermedia* Boulenger., FRESHWATER TORTOISE, 2 OF 12 INFECTED, 1 EACH

Location : Gall bladder

Locality : Jabalpur, M. P., India.

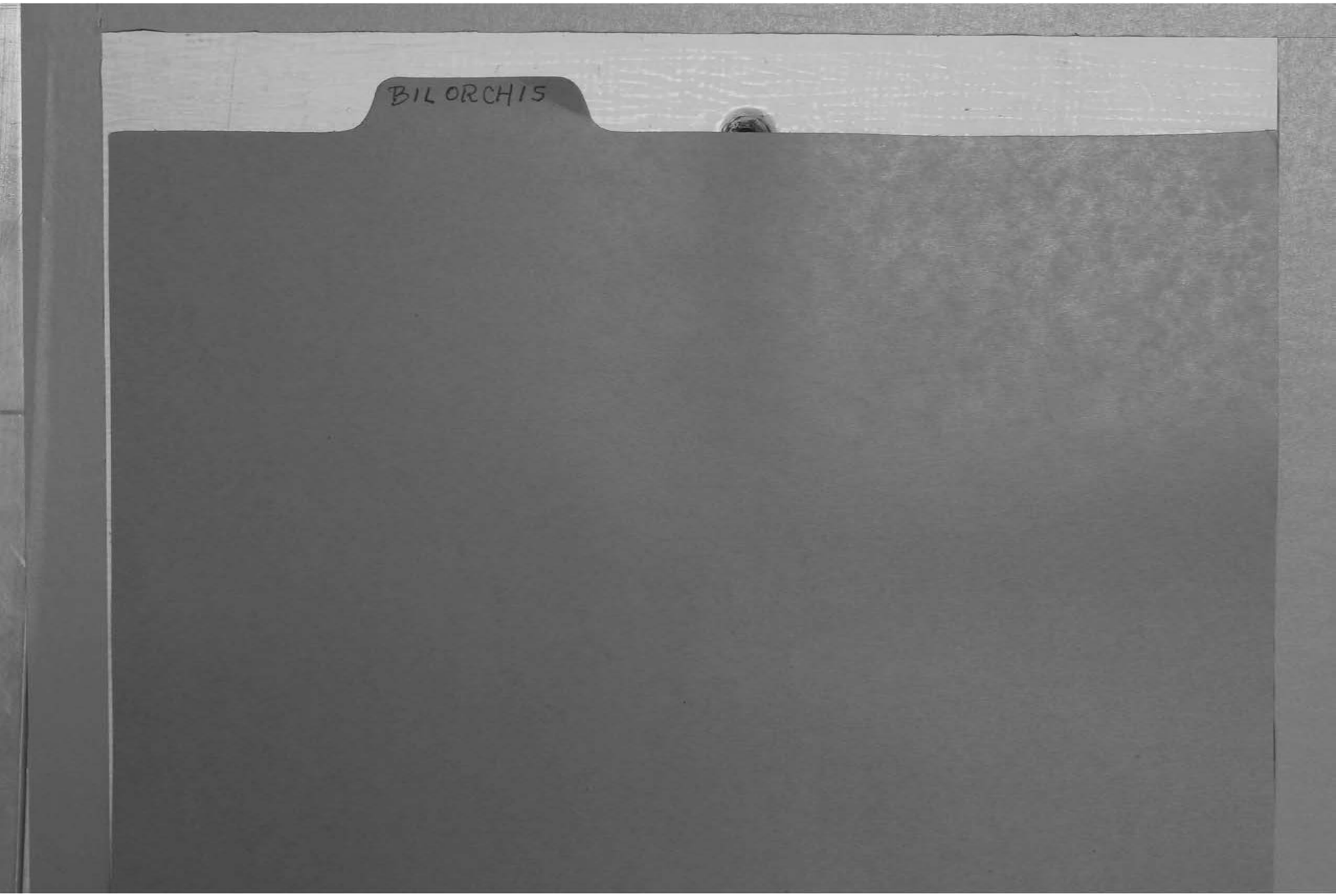
DISCUSSION

The present species, *Bilorchis mehrai* sp. nov., resembles genus *Bilorchis* Mehra (1937) in having nearly equal suckers; prepharynx; intestinal caecum reaching nearly to posterior extremity; submedian genital opening a little behind the intestinal bifurcation; symmetrical, parallel testes at about the middle of body length; elongated cirrus sac extending middle of ventral sucker; vesicula seminalis coiled; pars prostatica tubular; prostate glands well developed; short cirrus, ovary rounded, sinistral, pre-testicular, close outside the left posterior quadrant of ventral sucker projecting behind it; no receptaculum seminis; uterus post testicular; weak metraterm; vitellaria elongated, band like, confined to the edges of the body, composed of small follicles extending from intestinal bifurcation to a little distance in front of hinder end.

Bilorchis mehrai sp. nov., however, differs from indicum *Bilorchis* Mehra (1947) in having a long oesophagus; obliquely disposed cirrus sac and thin uterus with a few eggs. Author, hence, proposes the emendment in generic diagnosis, *oesophagus short or long; uterus large massive or thin, with many or a few eggs and cirrus sac median or oblique.*

So far the genus *Bilorchis* Mehra (1937) included a single species *B. indicum* Mehra, 1937. The new species differs from *Bilorchis indicum* Mehra (1937) in having band like pharynx of respective different dimensions; long oesophagus; position of ventral sucker; oblique disposition of cirrus sac; uterus thin with a few eggs, metraterm forming sigmoid curve and in all the body measurements, and this becomes the second species, *B. mehrai* n. sp.

INDIAN J. HELMINTHOL. 17 (1): 31-36


BILORCHIS

Plagiorchidae

BRACHYSACCUS Johnston,1912

Diagnosis after Johnston,1912.

Small,lancet-shaped worms, with a flattened elliptical cross-section. Integument spiny,the spines disappearing towards the posterior end. Ventral sucker at the beginning of the middle third of the body. Prepharynx,pharynx and esophagus present; intestinal limbs reaching the posterior end of the body. Excretory vesicle Y-shaped,with the stem running between the testes. Testes obliquely one behind the other in the posterior end of the body. Ovary between the testes and the ventral sucker. Copulatory organs present; genital pore on the ventral surface near the esophagus,cirrus sac wholly in front of the ventral sucker, and much shorter than in Dolichosaccus; a very long Laurer's canal and receptaculum present. Yolk glands lateral,mainly outside the intestinal limbs, extending from the intestinal fork to near the posterior end of the body. Coils of the uterus between the testes and the cirrus sac.
In the intestine and rectum of frogs.
Type species: Brachysaccus anartius Johnston,1912

"Brachysaccus seems to find its nearest relations in Opisthoglyphe and Dolichosaccus, differing from them mainly in the much more extended disposition of the uterus-loops, and the oblique position of the testes....."

Plagiorchidae

Brachysaccus anartius Johnston,1912

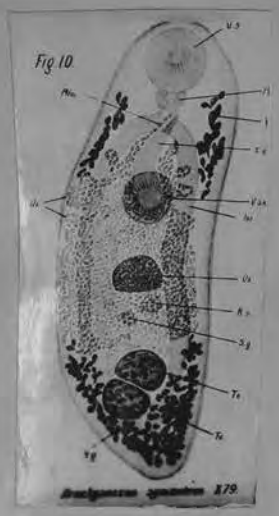
Small, lancet-shaped worms, with a flattened oval cross-section, about 3.3 by 1.2. Integument spiny, the spines disappearing toward the posterior end. Suckers almost equal in size, but the oral (0.205) rather smaller than the ventral (0.212) Pharynx comparatively large (0.148 in diameter) prepharynx well developed; esophagus about equal in length to the pharynx; intestinal limbs reaching the extreme posterior end of the body. Excretory vesicle Y-shaped,winding between the testes. Genital pore ventral, beneath the esophagus. Testes rounded 0.175 in diameter, lying obliquely behind one another in the middle of the posterior body-third. Ovary oval or rounded, smaller than the testes, 0.142 ,lying to one side of the middle line, about midway between the testes and ventral sucker. Laurer's canal very long. Yolk glands of numerous smallm follicles laterally placed,not extending fowards beyond the intestinal fork,nor inwards beyond the intestinal limbs while in front of the testes; but those on the left side cross over behind the testes and fill up some of the space between the testes and the posterior end of the body. Loops of the uterus richly developed, never reaching behind the testes, but filling up most of the space between the testes and cirrus sac. Eggs very numerous, 34 by 19 μ.
Host: intestine and rectum of Hyla aurea and Limnodynastes peronii.

Locality: Australia

Plagiorchidae

Brachysaccus symmetrus Johnston,1912

Somewhat lancet-shaped worms, moderately stout, about 1.47 by 0.57. Integument spiny, the spines disappearing toward the posterior end. Oral sucker 0.256, larger than the ventral sucker (0.215); ratio 6:5. Alimentary canal and excretory vesicle as in the genus; but the intestinal limbs do not extend so far back as in B.anartius. Testes oval, 0.147 by 0.105, lying very close together and obliquely one behind the other in the posterior end of the body. Ovary oval, about the same size as the testes, long diameter transversely placed, at about the middle of the body length. Yolk glands arranged in a pair of anterior and a pair of posterior masses. The anterior masses do not extend inwards beyond the intestinal limbs; but the posterior masses stretch under the whole surface, from the level of the testes backwards. Loops of uterus as in B.anartius. Eggs 34 by 19 µ.
Host: rectum of Hyla caerulea
Locality: Australia



BRACHYSACCUS